Draft
Environmental Impact Report

SCH# 2025120791

Volume 2

Appendix A to B3

Euismod Energy Storage Project
by Euismod Project LLC
& Euismod Project I, LLC
(*PP26401)*

ZCC No. 22, Map 233; CUP No. 18, Map 233;
CUP No. 19, Map 233; CUP No. 20, Map 233;
CUP No. 21, Map 233; ZV No. 10, Map 233;
Non-Summary Vacation, Map 233

Kern County
Planning and Natural Resources Department
Bakersfield, California

August 2026

Appendices—Volume 3

NOTE TO REVIEWER OF ELECTRONIC FILES:

To assist you in reviewing this electronic document, "bookmarks" have been provided for easier navigation between sections. When available, bookmarks are located in the panel to the left. Clicking on the bookmarks will take you to the selected item. This document may consist of multiple linked PDF files. If saving this document to your computer, you must save all corresponding files to a directory on your hard drive to maintain the manner in which these PDF documents are linked.

Appendix B4: Miscellaneous Air Quality Attachments

Appendix C1: Biological Resources Compendium Report

Appendix C2: Rare Plant Surveys

Appendix C3: Habitat Assessment Report

Appendix C4: Protocol Western Burrowing Owl Survey Report

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Appendix B4
Miscellaneous Air Quality Attachments

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2023
Area Designations for State Ambient Air Quality Standards
NITROGEN DIOXIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
OZONE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
CARBON MONOXIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
SULFUR DIOXIDE



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2023
Area Designations for State Ambient Air Quality Standards
PM10



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2023
Area Designations for State Ambient Air Quality Standards
PM2.5



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2023
Area Designations for State Ambient Air Quality Standards
HYDROGEN SULFIDE



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2023
Area Designations for State Ambient Air Quality Standards
LEAD



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2023
Area Designations for State Ambient Air Quality Standards
SULFATES



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2023
Area Designations for State Ambient Air Quality Standards
VISIBILITY REDUCING PARTICLES



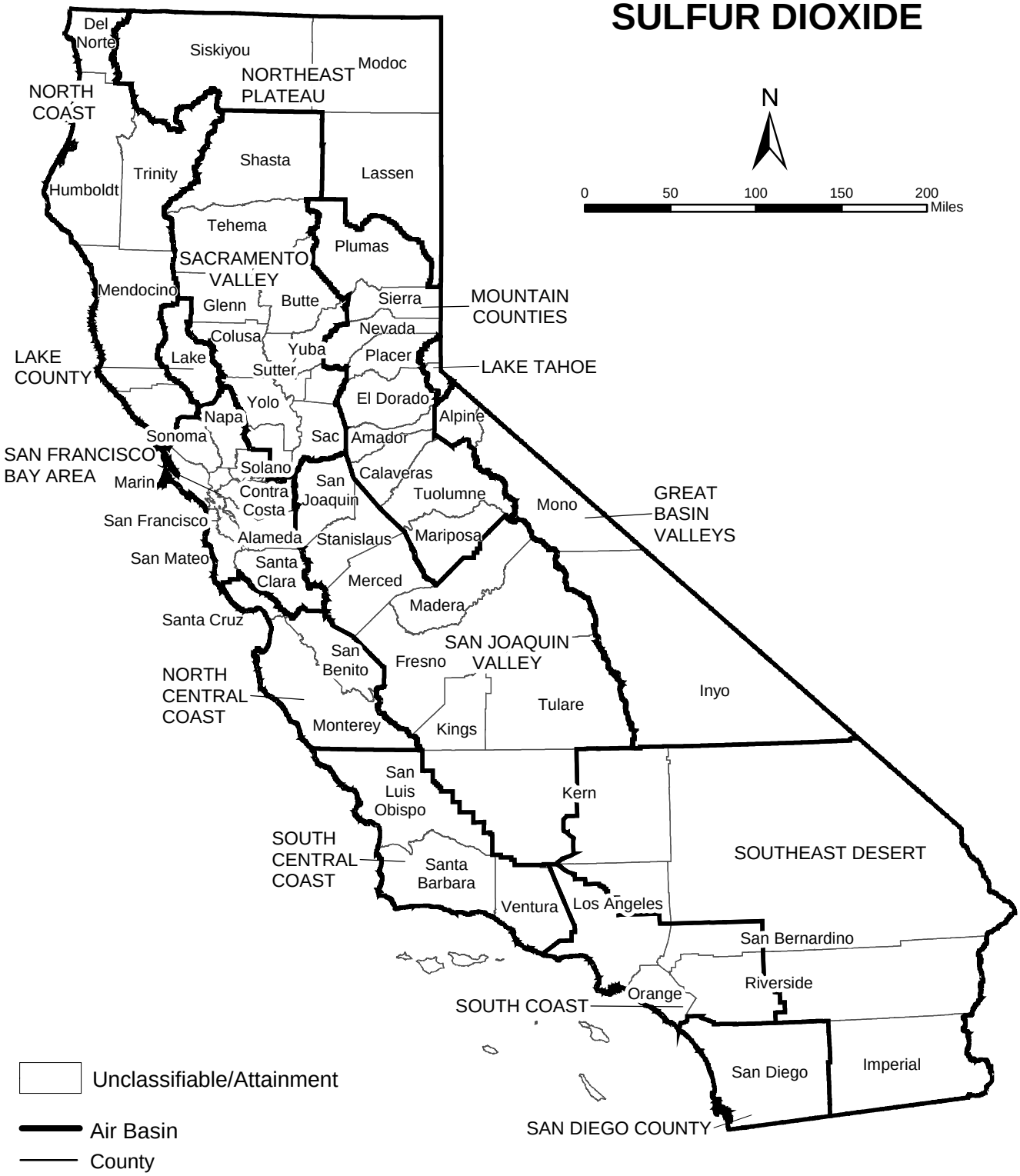
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Area Designations for National Ambient Air Quality Standards NITROGEN DIOXIDE



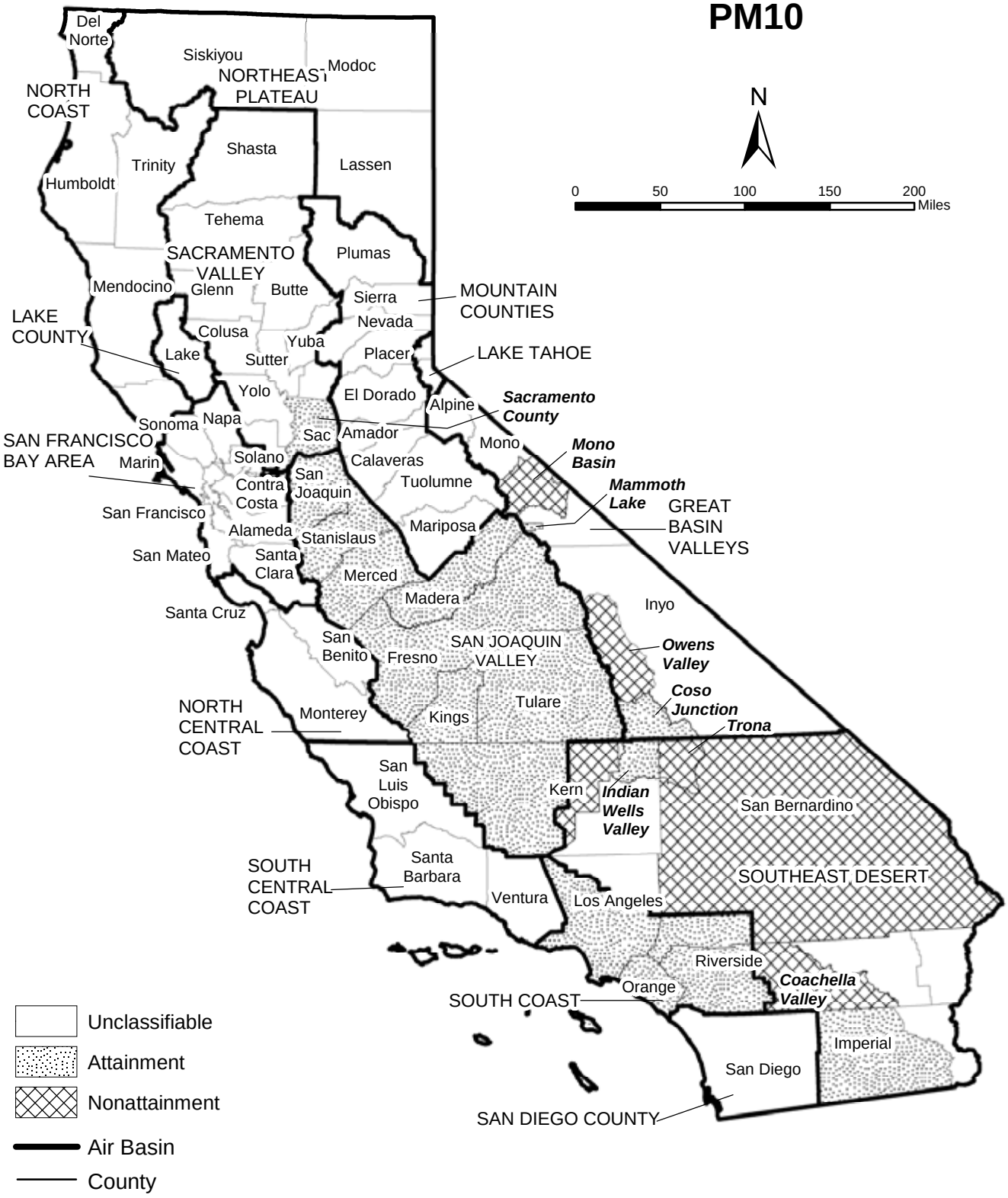
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Area Designations for National Ambient Air Quality Standards SULFUR DIOXIDE



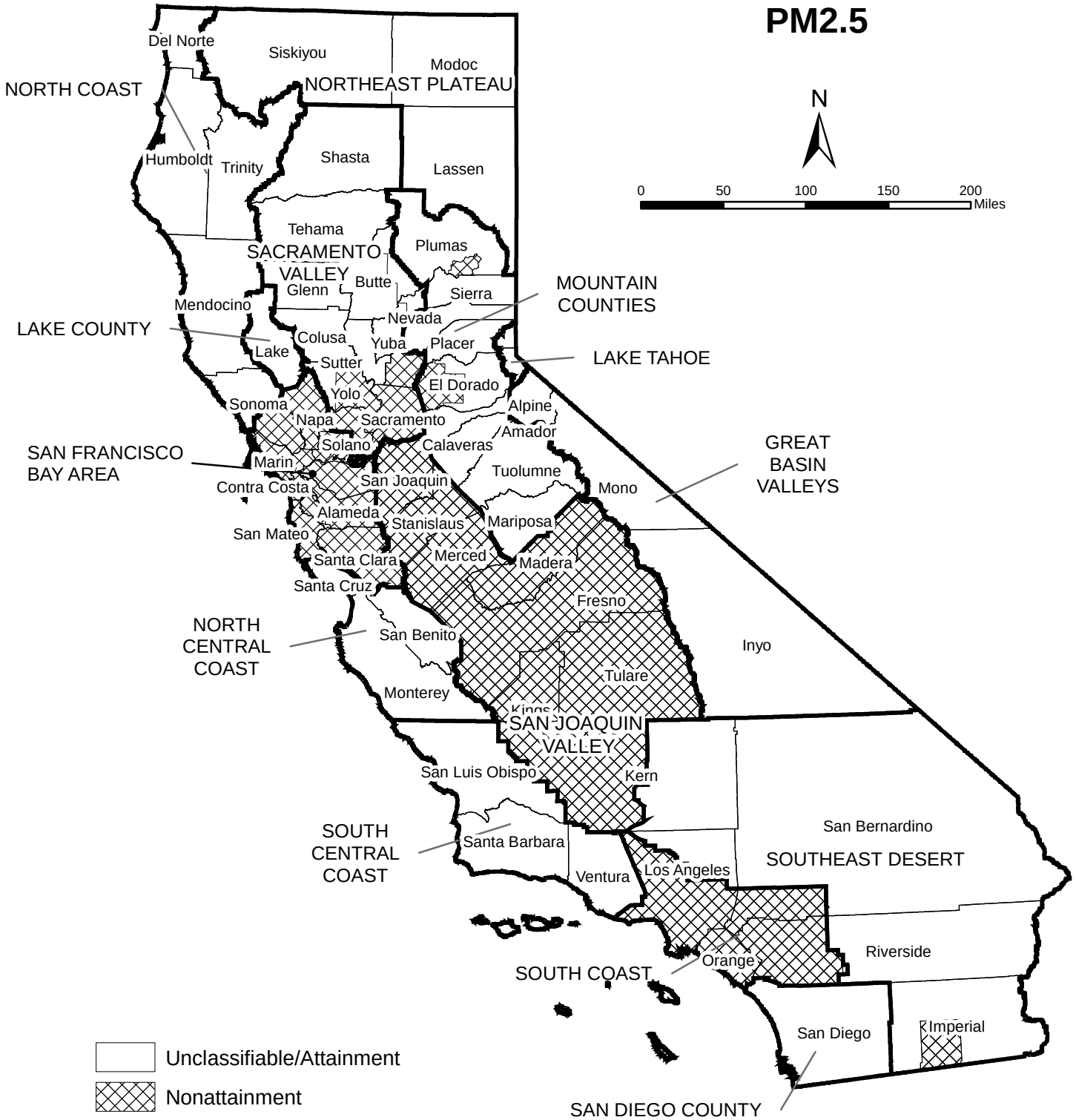
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Area Designations for National Ambient Air Quality Standards PM10



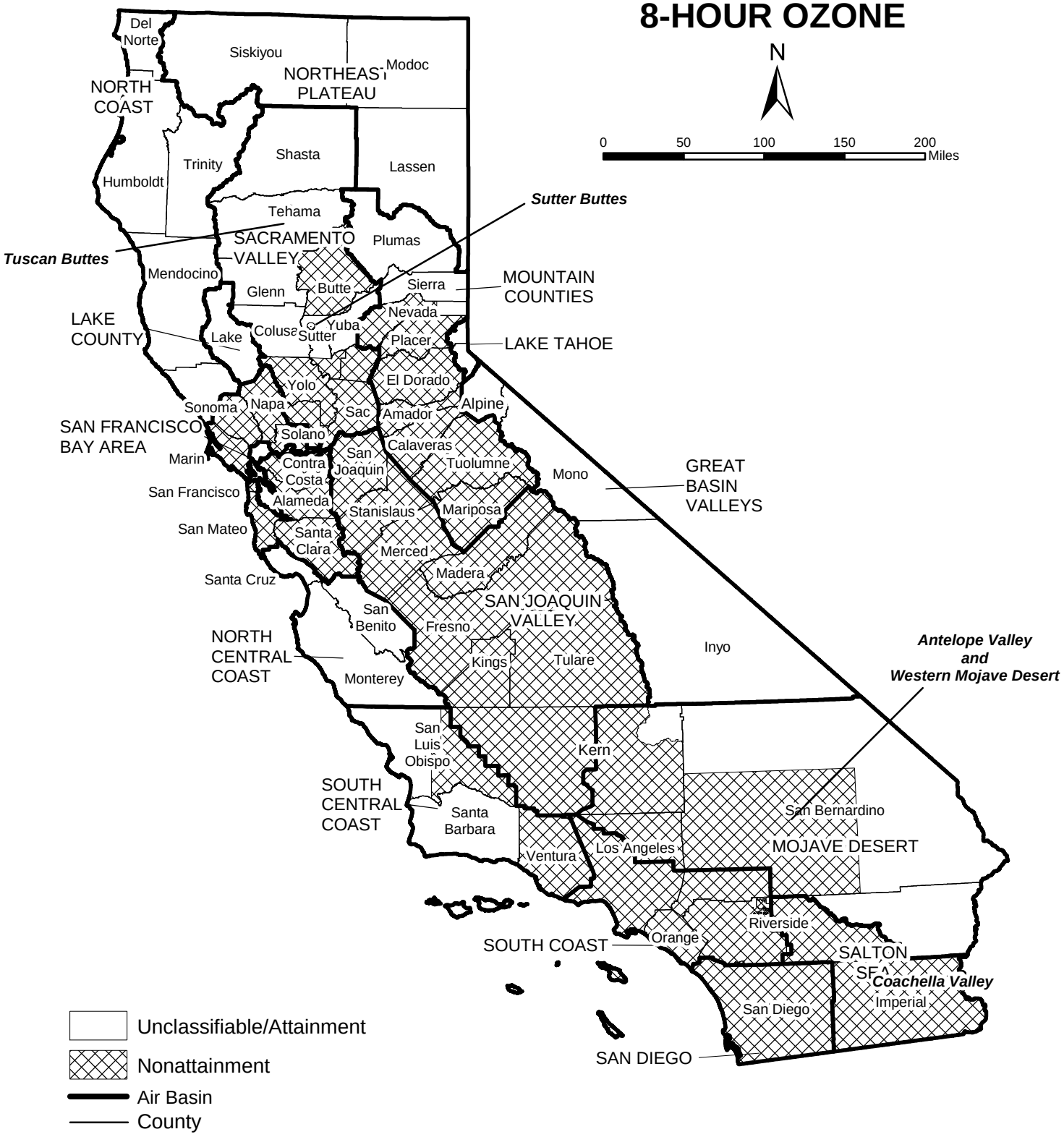
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Area Designations for National Ambient Air Quality Standards PM2.5



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Area Designations for National Ambient Air Quality Standards 8-HOUR OZONE



Last Reviewed: November 2023
Map reflects the 2015 8-hour ozone standard of 0.070 ppm
Air Quality Planning and Science Division, CARB

Area Designations for National Ambient Air Quality Standards CARBON MONOXIDE



Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards LEAD



Last Reviewed: November 2023
Air Quality Planning and Science Division

District Prioritization Scores and Risk Threshold Values

	Prioritization Score Threshold						Notification Level		Risk Reduction Audit & Plan	
District	Cancer		Non-Cancer Chronic		Non-Cancer Acute		Cancer(1)	Non-Cancer(2)	Cancer(1)	Non-Cancer(2)
	High	Low	High	Low	High	Low				
Amador	>=10	<=1	>=10	<=1	>=10	<=1	>=10	>=1	>=10	>=1
Antelope Valley	10	1	10	1	10	1	10	1	100	10
Bay Area	>=10	<1	>=10	<1	>=10	<1	10	>1	100	10
Butte	100	1	100	1	100	1	10	>=1	none	none
Calaveras	none	none	none	none	none	none	10	none	10	none
Colusa	>10	<1	>10	<1	>10	<1	>10	>1	>10	>1
El Dorado	none	none	none	none	none	none	none	none	none	none
Feather River	100	<1	100	<1	100	<1	10	1	none	none
Great Basin Unified	10	1	10	1	10	1	none	none	none	none
Glenn	10	1	10	1	10	1	10	1	none	none
Imperial	10	1	10	1	10	1	10	1	none	none
Kern	10	<1	10	<1	10	<1	10	1	100	5

Lake	10	1	10	1	10	1	none	none	20	none
Lassen	100	10	100	10	100	10	none	none	none	none
Monterey Bay Unified	>10	>10	>10	>10	>10	>10	10	>1	10	>1
Mendocino	10	1	10	1	10	1	10	1	none	none
Modoc	none	none	none	none	none	none	none	none	none	none
Mojave	10	1	10	1	10	1	10	1	100	10
Mariposa	none	none	none	none	none	none	none	none	none	none
North Coast Unified	50	10	50	10	50	10	10	1	none	none
Northern Sierra	10	1	10	1	10	1	none	none	none	none
Northern Sonoma	10	1	10	1	10	1	10	1	100	10
Placer	10	1	10	1	10	1	>=10	>=1	>=10	>=1
Sacramento	10	1	10	1	10	1	>=10	>=1	10	>1
San Diego	100	1	10	1	10	1	10	1	100	1
San Joaquin Valley	10	1	10	1	10	1	10	>1	100	>5
San Luis Obispo	>=10	>=10	>=10	>=10	>=10	>=10	>=10	>=1	>=10	>=1
Santa Barbara	10	1	10	1	10	1	10	>1	10	1
Shasta	100	1	100	1	100	1	10	1	10	1

Siskiyou	>100	<1	>100	<1	>100	<1	10	1	100	5
South Coast	10	1	10	1	10	1	>=10	>1; lead THI >.5	>25	>3
Tehama	100	1	100	1	100	1	none	none	none	none
Tuolumne	50	10	50	10	50	10	10	>1	10	>1
Ventura	10	1	10	1	10	1	10	>=1	none	none
Yolo-Solano	10	1	10	1	10	1	10	1	none	none

(1) Cancer Risk (Definition)

(2) Non-Cancer Acute or Chronic Hazard Index (Definition)

This page last reviewed on August 1, 2008

"Hot Spots" Program

Eastern Kern Air Pollution Control District Policy

Addendum to CEQA Guidelines Addressing GHG Emission Impacts For Stationary Source Projects When Serving As Lead CEQA Agency

Board Adopted
March 8, 2012

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I. PURPOSE

This Policy establishes and details the process of evaluating new or modified stationary source Greenhouse Gas (GHG) emissions impacts on global climate change (climate change) for purposes of the California Environmental Quality Act (CEQA). This Policy is to be used when the Eastern Kern Air Pollution Control District (EKAPCD) has discretionary approval authority over new stationary source projects and serves as lead CEQA review agency when determining GHG emissions significance.

Project-Specific CEQA significance for GHG Emissions will be assessed as follows:

A. If project is exempt from CEQA due to either a statutory or categorical exemption, no further analysis under CEQA is required.

B. Project-Specific GHG Emissions must be quantified if the project is not exempt from CEQA.

C. Project is considered to have a less than significant impact on GHG emissions if it meets one of the following conditions:

1. Project-Specific GHG emissions are less than 25,000 tons per year (tpy);

2. Project demonstrates to EKAPCD that it is in compliance with state GHG reduction plan such as AB 32or future federal GHG reduction plan if it is more stringent than state plan;

3. Project GHG emissions will be mitigated to a less than significant impact if GHGs can be reduced by at least 20% below Business-As-Usual (BAU) through implementation of one or more of the following strategies:

(a) Compliance with a Best Performance Standard (BPS) as set forth in Section VI of this Policy;

(b) Compliance with GHG Offset as detailed in Section VI of this Policy;

(c) Compliance with an Alternative GHG Reduction Strategy as discussed in Section VII of this Policy.

D. If none of the above is met the project will be deemed significant and an Environmental Impact Report (EIR) will be required.

II. BACKGROUND

A. State GHG Reduction Program

California is the twelfth largest emitter of GHGs in the world and second largest emitter in the United States. In recognizing the need to reduce California's GHGs, Assembly

Speaker Fabian Nunez, and Assembly Member Fran Pavley introduced Assembly Bill 32, California Global Warming Solutions Act of 2006 (AB 32) to the State Legislature in early 2006. The legislation clearly designates the California Air Resources Board (ARB) as the leading agency for developing a plan to address GHG emissions in California. Governor Schwarzenegger signed AB 32 into law on September 27, 2006.

AB 32 states that climate change poses a threat to California's economy, public health, natural resources, and environment, and states the necessity of federal and international action to effectively combat global warming. AB 32 is the first law to limit GHG emissions at the state level and is considered to be the most comprehensive, economy-wide climate change policy in the nation by committing to lower California's GHG emission levels to 11% below business as usual to 1990 levels by 2020, 25% below 1990 levels by 2025, and 80% below 1990 levels by 2050.

As the designated lead state agency responsible for establishing and implementing all aspects of AB 32, ARB has development a Scoping Plan designed to achieve the statutory GHG reduction goals. In December 2008, ARB released a Scoping Plan that recommended a mix of GHG emission reduction strategies designed to meet the targets established in AB 32 that included compliance requirements, a market-based cap-and-trade program, and other GHG reduction incentives. The 2008 Scoping Plan was challenged under CEQA and in August 2011 ARB approved a Supplement to the AB 32 Scoping Plan that updated emission projections in light of the economic downturn. The updated projections in the 2011 Scoping Plan estimates 2020 BAU GHG emissions of 506 million metric tons (MMT) of CO2 equivalents (CO2e). This would require a reduction of 80 MMT of CO2e, which equates to a 16% statewide reduction (20% reductions from Industrial Sources) in order to meet the 1990 GHG levels by 2020. The original 2008 Scoping Plan estimated that 2020 BAU GHG emissions would be 596 MMT of CO2e, and projected that 174 MMT of CO2e (27.3% state-wide) reductions were required in order to meet 1990 levels by 2020

The Scoping Plan relies in part on the Cap-and-Trade Program (Program) in order to meet the GHG reduction targets. The first phase of the Program will be initiated on January 1, 2013 and will include 600 facilities, which produce 85% of the GHG emissions throughout California's economy. The Program requires listed sources to reduce GHGs in accordance with emission levels established for each facility. Under the Program GHGs will be represented and traded by allowances with each allowance representing one ton of CO2e. Each year allowances in the program will be reduced until the 1990 emission levels are reached in 2020.

On December 22, 2011, ARB adopted the allowance allocation requirements for the Cap-and-Trade Program. Allowances are calculated based upon the type of industry, the fuel efficiency standard set for the industry and the actual GHG emissions in the base year. The rule includes a chart of the annual GHG allowances beginning in 2013 and ending in 2020 when the 1990 BAU levels must be met. The allowance budget decreases for the first two years (2013 and 2014), dramatically increases with the second phase in 2015 when additional GHG sources are required to enter the Program and then decreases steadily by slightly over 12 million tons per year to meet the 2020 target.

B. Federal GHG Reduction Program

There is currently no federal GHG reduction program. If a federal program is adopted in the future that is more stringent than the state GHG reduction program then EKAPCD will revise this policy to include it.

C. GHG CEQA Review

Lead agencies are required to establish specific procedures for administering its responsibilities under CEQA. These requirements include orderly project evaluation and preparation of environmental documents. On April 13, 2009, the Governor's Office of Planning and Research sent proposed amendments of the CEQA Guidelines to the Secretary of the Resources Agency for promulgation. The amendments require lead agencies to determine new stationary source project GHG emissions significance on climate change.

EKAPCD staff anticipates that most projects within its jurisdiction will be subject to CEQA review for GHG emission impacts by other lead agencies and only a few projects each year will be subject to review by EKAPCD acting as lead agency. These projects are anticipated to be large industrial projects or modifications to existing industrial projects that do not require conditional use permits from a land-use agency or a permit from the California Energy Commission. Smaller industrial projects that EKAPCD serves as lead CEQA review agency would be below the significance threshold for GHGs.

EKAPCD staff has reviewed various methods of addressing GHG emissions through the CEQA process and recommends EKAPCD should follow an approach compatible with San Joaquin Valley Air Pollution Control District (SJVAPCD)'s approach. Due to geography Kern County is divided into two air districts. EKAPCD has the Eastern portion and the western portion is included in the SJVAPCD. By following a CEQA GHG review process similar to SJVAPCD's, EKAPCD will maintain substantial consistency throughout Kern County.

D. SJVAPCD GHG CEQA Policy

SJVAPCD's Governing Board adopted a Climate Change Action Plan (CCAP) that directed their APCO to develop guidance to assist SJVAPCD staff, valley businesses, land–use agencies, and other permitting agencies in addressing GHG emissions as part of the CEQA process. SJVAPCD prepared a staff report titled, *Addressing Greenhouse Gas Emissions under the California Environmental Quality Act* to support their CEQA GHG policy. The staff report provides a summary of background information on climate change, the current regulatory environment surrounding GHG emissions, and the various concepts in addressing the potential impacts of climate change. The report also evaluates different approaches for estimating impacts and summarizes potential GHG emission reduction measures.

This policy incorporates SJVAPCD's staff report, *Addressing Greenhouse Gas Emissions under the California Environmental Quality Act* by reference as an additional support document for EKAPCD's CEQA GHG review approach and methodology for approved BPS as detailed in Appendix B of this Policy.

III. DETERMINING PROJECT SIGNIFICANCE

CEQA encourages lead agencies to develop and publish thresholds of significance for use in determining the significance of environmental impacts. EKAPCD proposes the following process for determining individual and cumulative significance of project specific GHG emissions on climate change when issuing permits for new stationary source projects:

A. Project subject to a CEQA statutory exemption or subject to a CEQA categorical exemption that does not otherwise have significant individual and cumulative effects on GHG emissions would not require further CEQA review.

B. Project that is not exempt from CEQA would require quantification of Project-Specific GHG Emissions to determine annual GHG emissions.

C. Project that emits less than 25,000 tons per year (tpy) of GHGs would be determined to have a less than significant individual or cumulatively considerable impact on GHG emissions and would not require further CEQA review.

   EKAPCD believes a 25,000 tpy threshold is appropriate for determining that a project will have no significant or cumulatively considerable impact because:

   1. 25,000 tpy is the EKAPCD GHG reporting requirement as stated in Section VI.B of EKAPCD Rule 201.3, Federally Enforceable Limits on Potential to Emit. ARB and EPA have determined that a 25,000 metric ton per year (mtpy) threshold is appropriate for GHG reporting because it would encompasses facilities whose GHG emissions may be subject to regulation. (See 74 Fed. Reg. 56260, 56273 (Oct. 30, 2009)); and

   2. 25,000 tpy is less than the threshold ARB uses for industrial source applicability as the first phase of the AB 32 Cap-and Trade Program and is therefore slightly more stringent than the Cap-and-Trade Program. (See ARB, Cap-and-Trade Instructional Guidance, Cap-and-Trade regulation Applicability Guidance (Jan. 2012)).

D. Project with Project-Specific GHG Emissions equal to or greater than 25,000 tpy will be assessed for CEQA significance as follows:

   1. Project subject to a state or federal GHG emission reduction plan or program that can demonstrate to EKAPCD that the project will be in compliance with such plan or program would be determined less than significant. State or federal GHG reduction plans or programs must be specified in law. For example, if a project

will be covered by the Cap-and-Trade Program, which is designed to require reductions in GHG emissions consistent with the statutory goals set forth in AB 32, the project would be in compliance with a state GHG emission reduction program and under this Policy the project would be determined to have a less than significant or cumulatively considerable impact on GHG emissions. The APCO will consider each project's compliance with state or federal GHG reduction plans or programs on a project-by-project basis.

2. Project that implements one or more of the following strategies that achieve at least a combined 20% reduction in GHG emissions compared to BAU will be determined to be less than significant:

   (a) BPS as set forth in Section VI of this Policy;

   (b) Offsets as defined in Section III of this Policy;

   (c) Alternative GHG Reduction Strategies as defined in Section III and discussed in Section VII of this Policy.

   EKAPCD believes that a 20% reduction in GHGs compared to BAU is appropriate because it reflects the Industrial Sector target listed in the Final Supplement to the AB 32 Scoping Plan Functional Equivalent Document released August 19, 2011 and is more conservative than the 16% overall reduction set forth in the Scoping Plan.

E. Project that is not exempt from CEQA, not subject to an adopted state or federal GHG reduction plan, or cannot demonstrate that Project-Specific GHG Emissions will be reduced at least 20% below BAU will require preparation of an EIR.

IV. ESTABLISHING BAU AND BASELINE

In executing its legislative mandate to establish emission reduction targets which would achieve 1990 GHG emission levels by the year 2020, ARB used its emission inventory to establish a three-year average for GHG emissions occurring by sector during the baseline period of 2002-2004. This three-year average baseline emissions inventory was projected to the year 2020 using assumptions about potential growth, and assuming no change in the existing business practices. ARB has determined that a 20% reduction from the Industrial Sector's BAU is necessary in order to achieve 1990 GHG emissions level by 2020.

BAU as established by ARB is a projected emissions inventory and does not represent actual business or operational practices generating GHG emissions. To translate BAU into an emissions generating activity, EKAPCD staff will establish emission factors per unit of activity for each class and category using the Baseline as defined in Appendix A of this policy.

Example: an emissions factor for a combustion process could be expressed as pounds of GHG emissions generated per cubic feet of gas consumed or pounds of GHG emissions generated per unit of production.

GHG emission reductions would be determined by establishing a GHG emissions factor per unit of activity for the proposed project and comparing it to the emissions factor established for the baseline period.

The percent reduction in GHG emissions would be calculated using the following methodology:

$$\% \text{ Reduction in GHGs} = \frac{\text{(Baseline GHG factor) - (Proposed project GHG factor)}}{\text{Baseline GHG factor}} \times 100\%$$

V. ESTABLISHING BPS

Use of BPS streamlines the significance determination process by pre-quantifying the emission reductions that would be achieved by a specific GHG emission reduction measure and pre-approving the use of such a measure to reduce project-related GHG emissions. Establishing BPS also streamlines the CEQA review process by providing EKAPCD staff, project proponents, and the public with clear guidance on how to reduce GHG emission impacts. Thus, if a project proponent incorporates GHG reduction measures during the initial project design phase that reduces Project-Specific GHG emissions by at least 20% the project would be considered mitigated to less than significant.

A. Process for Establishing BPS

BPS will be the most effective Achieved-in-Practice means of reducing or limiting GHG emissions from a GHG emissions source. EKAPCD will develop and approve BPS for specific classes and categories of stationary sources for use within the District, or adopt a BPS that has been developed, approved and implemented by another air district, ARB, or CAPCOA. To ensure a BPS reflects the most current available technology periodic reviews will be conducted and approved BPS will be revised as necessary. Revisions to BPS only apply to future projects and do not apply retroactively to projects already permitted or approved.

B. Process Steps for BPS Developed by EKAPCD

EKAPCD will implement the following process for developing a BPS:

1. Establish Baseline GHG emissions factor per unit of activity for the proposed equipment or operation identified within a specific class and category.

2. For the specific equipment or operation being proposed within a specific class and category, list all technologically feasible GHG emissions reduction measures, including equipment selection, design elements and best management practices, that

do not result in an increase in criteria pollutant emissions compared to the proposed equipment or operation.

3. For all technologically feasible GHG emission reduction measures identified in Step 2, identify all GHG reduction measures determined to be Achieved-in-Practice. In determining Achieved-in-Practice, consider the extent to which grants or other financial subsidies influence economic feasibility.

4. For each Achieved-in-Practice GHG emission reduction measure identified in Step 3:

   (a) Quantify the potential GHG emission reduction, as compared to the Baseline GHG emissions factor per unit of activity; and

   (b) Express the potential GHG emission reduction as a percent of Baseline GHG emissions factor per unit of activity.

5. Rank all Achieved-in-Practice GHG emission reduction measures by order of percent GHG emissions reduction.

6. Deem the Achieved-in-Practice GHG emissions reduction measure(s) with the highest percent reduction in GHG emissions as the EKAPCD approved BPS for the respective class and category of equipment or operation being proposed.

7. Public notice for proposed BPS will be provided through a workshop notice posted on the EKAPCD website and hard copies mailed to stakeholders and other interested parties no less than 3 weeks before the workshop. If the BPS affects a large number of sources or significant public participation is anticipated an official public notice will be released at least 30 days prior to the workshop. An electronic copy of proposed BPS will be made available on the EKAPCD's website and hard copy will be made available in the EKAPCD's administrative office prior to the workshop.

8. Hold a public workshop to present proposed BPS to stakeholders and other interested parties.

9. Provide 30-day question, comment, and suggestion period on proposed BPS.

10. The final draft of a proposed BPS will be presented to EKAPCD's Governing Board for adoption. Once the Board adopts the BPS it will become part of the EKAPCD's GHG CEQA policy.

C. Process Steps for Incorporating BPS by Reference

BPS located in Appendix B have been developed, approved, and implemented by SJVAPCD and are adopted by reference into this Policy. Any other or future SJVAPCD BPS must be approved by the APCO prior to being implemented in EKAPCD. Furthermore, the APCO may adopt a BPS by reference for specific equipment or operation that has been developed, approved, and implemented by another air district, CAPCOA, ARB, or EPA. In such cases EKAPCD staff will review and evaluate the

BPS. The APCO must approve the BPS prior to its use within the District. A BPS that is adopted by reference is not required to undergo the public review process.
BPS must demonstrate that it achieves quantifiable GHG emission reductions in order to be approved for use within the District. EKAPCD may rely on the findings of a BPS developed, approved, or implemented by another agency, including but not limited to, GHG emissions quantification or percent of GHG reductions achieved by the BPS.

VI. COMPLIANCE WITH GHG OFFSET

Project proponents may propose a reduction or removal of GHG emissions occurring elsewhere to compensate for, or offset an increase in GHG emissions resulting from the project. Individual projects can be developed to achieve the reduction of emissions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. Any offset must be real, permanent, quantifiable, verifiable, enforceable, and subject to APCO approval.

VII. ALTERNATE STRATEGY FOR REDUCTIONS

Implementation of strategies to achieve AB 32 emission reduction targets is anticipated to drive technology development, potentially obsolescing or improving established standards over time.

Project proponents may propose other technologies, equipment designs, or operational/maintenance practices in lieu of an adopted BPS or if no BPS is available. An alternative GHG reduction strategy must demonstrate that Project-Specific GHG Emissions would be reduced or mitigated by at least 20% compared to BAU. The APCO will evaluate and approve the proposed alternative GHG emission reduction strategy if it is found to be appropriate for the project.

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APPENDIX A
DEFINITIONS

A. Achieved-in-Practice: Any equipment, technology, practice or operation available in the United States that has been installed and operated or used at stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, technology, practice or operation is reliable when operated in a manner that is typical for the process. In determining whether equipment, technology, practice or operation is Achieved-in-Practice, the EKAPCD will consider the extent to which grants, incentives or other financial subsidies influence the economic feasibility of its use.

B. Alternate Strategies for Reductions: Technologies, equipment designs, or operation/maintenance practices proposed by a project sponsor in lieu of an adopted BPS if no BPS is available, where the project sponsor can demonstrate that Project-Specific GHG Emissions would be reduced by at least 20% compared to BAU.

C. APCO: Air Pollution Control Officer, or his designee.

D. Approved Alternate Technology: Any EKAPCD approved, Non-Achieved-in-Practice GHG emissions reduction measure equal to or exceeding the GHG emission reduction percentage for a specific BPS.

E. Baseline: Three year average (2002-2004) of GHG emissions for a type of equipment or operation within an identified class and category, expressed as annual GHG emissions per unit. The percent reduction in GHG emissions is calculated using the following methodology:

$$\% \text{ Reduction in GHGs} = \frac{\text{(2002-2004 baseline GHG factor) - (Proposed project GHG factor)}}{\text{2002-2004 baseline GHG factor}} \times 100\%$$

F. Best Performance Standard (BPS): For a specific Class and Category, the most effective, EKAPCD approved, and Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, which is also economically feasible per the definition of Achieved-in-Practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

G. Business-As-Usual (BAU): Emissions for a type of equipment or operation within an identified class and category projected for the year 2020, assuming no change in GHG emissions per unit of activity as established for the baseline period.

H. Category: EKAPCD approved subdivision within a “class” as identified by unique operational or technical aspects.

I. Class: Broadest EKAPCD approved division of stationary GHG sources based on fundamental type of equipment or industrial classification of the source operation.

J. GHG Offset: Reduction, removal, or avoidance of GHG emissions that is used to compensate for GHG emissions that occur elsewhere, subject to approval of APCO.

K. Metric Ton per Year (mtpy): Tonne = 2,204.6 pounds (1000 kg).

L. Project-Specific GHG Emissions: Emissions resulting from a specific operation or process, e.g. fuel combustion emissions from a boiler. Project-Specific GHG Emissions will be quantified in accordance with established Clean Air Act permit requirements or through methodology approved by the APCO on a project-specific basis.

M. Ton Per Year (tpy): United States short ton = 2000 lb (907.2 kg).

APPENDIX B
ADOPTED BEST PERFORMANCE STANDARDS

This appendix contains a list of Best Performance Standards (BPS) approved for use with in the Eastern Kern Air Pollution Control District (EKAPCD).

The following list of BPS is adopted by reference from the San Joaquin Valley Air Pollution Control District:

- Fossil Fuel-Fired Boilers, Steam Generators & Process Heaters With Firing Capacity > 5 MMBtu/hour (HHV): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Non-Emergency Onsite Electric Power Generation with Fossil Fuel Combustion > 5 MMBtu/hour Or With Fossil Fuel-Fired Mechanical Driver > 50 bhp: (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Non-Emergency Mechanical Equipment Driver (requirement in lieu of reciprocating IC engines > 50 hp and combustion turbines > 3 MMBtu/hour excluding combustion turbines in cogeneration service): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Cogeneration – Topping Cycle Plants (not including Combined Cycle units): (SJVAPCD BPS, Effective November 1, 2011);

- Landfill Operations: (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Direct-Fired Combustion Heat Transfer Equipment (Dryers, Kilns, etc): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009).

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Appendix

San Joaquin Valley Air Pollution Control District and South Coast Air Quality Management District *Sierra Club v. County of Fresno* Amicus Curiae Briefs

SUPREME COURT COPY

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

SUPREME COURT
FILED
APR 13 2015
Frank A. McGuire Clerk
Deputy

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

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APPLICATION

Pursuant to California Rules of Court 8.520(f)(1), proposed Amicus Curiae San Joaquin Valley Unified Air Pollution Control District hereby requests permission from the Chief Justice to file an amicus brief in support of Defendant and Respondent, County of Fresno, and Defendant and Real Parties in Interest Friant Ranch, L.P. Pursuant to Rule 8.520(f)(5) of the California Rules of Court, the proposed amicus curiae brief is combined with this Application. The brief addresses the following issue certified by this Court for review:

> Is an EIR adequate when it identifies the health impacts of air pollution and quantifies a project's expected emissions, or does CEQA further require the EIR to *correlate* a project's air quality emissions to specific health impacts?

As of the date of this filing, the deadline for the final reply brief on the merits was March 5, 2015. Accordingly, under Rule 8.520(f)(2), this application and brief are timely.

1. Background and Interest of San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Unified Air Pollution Control District ("Air District") regulates air quality in the eight counties comprising the San Joaquin Valley ("Central Valley"): Kern, Tulare, Madera, Fresno, Merced, San Joaquin, Stanislaus, and Kings, and is primarily responsible for attaining air quality standards within its jurisdiction. After billions of dollars of investment by Central Valley businesses, pioneering air quality regulations, and consistent efforts by residents, the Central Valley air basin has made historic improvements in air quality.

The Central Valley's geographical, topographical and meteorological features create exceptionally challenging air quality

conditions. For example, it receives air pollution transported from the San Francisco Bay Area and northern Central Valley communities, and the southern portion of the Central Valley includes three mountain ranges (Sierra, Tehachapi, and Coastal) that, under some meteorological conditions, effectively trap air pollution. Central Valley air pollution is only a fraction of what the Bay Area and Los Angeles produce, but these natural conditions result in air quality conditions that are only marginally better than Los Angeles, even though about ten times more pollution is emitted in the Los Angeles region. Bay Area air quality is much better than the Central Valley's, even though the Bay Area produces about six times more pollution. The Central Valley also receives air pollution transported from the Bay Area and northern counties in the Central Valley, including Sacramento, and transboundary anthropogenic ozone from as far away as China.

Notwithstanding these challenges, the Central Valley has reduced emissions at the same or better rate than other areas in California and has achieved unparalleled milestones in protecting public health and the environment:

- In the last decade, the Central Valley became the first air basin classified by the federal government under the Clean Air Act as a "serious nonattainment" area to come into attainment of health-based National Ambient Air Quality Standard ("NAAQS") for coarse particulate matter (PM10), an achievement made even more notable given the Valley's extensive agricultural sector. Unhealthy levels of particulate matter can cause and exacerbate a range of chronic and acute illnesses.
- In 2013, the Central Valley became the first air basin in the country to improve from a federal designation of "extreme" nonattainment to

actually attain (and quality for an attainment designation) of the 1-hour ozone NAAQS; ozone creates "smog" and, like PM10, causes adverse health impacts.

- The Central Valley also is in full attainment of federal standards for lead, nitrogen dioxide, sulfur dioxide, and carbon monoxide.
- The Central Valley continues to make progress toward compliance with its last two attainment standards, with the number of exceedences for the 8-hour ozone NAAQS reduced by 74% (for the 1997 standard) and 38% (for the 2008 standard) since 1991, and for the small particulate matter (PM2.5) NAAQS reduced by 85% (for the 1997 standard) and 61% (for the 2006 standard).

Sustained improvement in Central Valley air quality requires a rigorous and comprehensive regulatory framework that includes prohibitions (e.g., on wood-burning fireplaces in new residences), mandates (e.g., requiring the installation of best available pollution reduction technologies on new and modified equipment and industrial operations), innovations (e.g., fees assessed against residential development to fund pollution reduction actions to "offset" vehicular emissions associated with new residences), incentive programs (e.g., funding replacements of older, more polluting heavy duty trucks and school buses)[1], ongoing planning for continued air quality improvements, and enforcement of Air District permits and regulations.

The Air District is also an expert air quality agency for the eight counties and cities in the San Joaquin Valley. In that capacity, the Air District has developed air quality emission guidelines for use by the Central

[1] San Joaquin's incentive program has been so successful that through 2012, it has awarded over $ 432 million in incentive funds and has achieved 93,349 tons of lifetime emissions reductions. *See* SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, 2012 PM2.5 PLAN, 6-6 (2012) *available at* http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/06%20Chapter%206%20Incentives.pdf.

Valley counties and cities that implement the California Environment Quality Act (CEQA).[2] In its guidance, the Air District has distinguished between toxic air contaminants and criteria air pollutants.[3] Recognizing this distinction, the Air District's CEQA Guidance has adopted distinct thresholds of significance for *criteria* pollutants (i.e., ozone, PM2.5 and their respective precursor pollutants) based upon scientific and factual data which demonstrates the level that can be accommodated on a cumulative basis in the San Joaquin Valley without affecting the attainment of the applicable NAAQS.[4] For *toxic air* pollutants, the District has adopted different thresholds of significance which scientific and factual data demonstrates has the potential to expose sensitive receptors (i.e., children, the elderly) to levels which may result in localized health impacts.[5]

The Air District's CEQA Guidance was followed by the County of Fresno in its environment review of the Friant Ranch project, for which the Air District also served as a commenting agency. The Court of Appeal's holding, however, requiring correlation between the project's criteria

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[2] *See, e.g.*, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, PLANNING DIVISION, GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS (2015), *available at* http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf ("CEQA Guidance").

[3] Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health, they are distinguishable from toxic air contaminants and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of toxic air contaminants occurs solely under section 112 of the Act. Compare 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 with 42 U.S.C. § 7411.

[4] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 64-66, 80.

[5] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 66, 99-101.

pollutants and local health impacts, departs from the Air District's Guidance and approved methodology for assessing criteria pollutants. A close reading of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants (for which a local health risk assessment is feasible and routinely performed) and criteria air pollutants (for which a local health risk assessment is not feasible and would result in speculative results).[6] The Air District has a direct interest in ensuring the lawfulness and consistent application of its CEQA Guidance, and will explain how the Court of Appeal departed from the Air District's long-standing CEQA Guidance in addressing criteria pollutants and toxic air contaminants in this amicus brief.

2. How the Proposed Amicus Curiae Brief Will Assist the Court

As counsel for the proposed amicus curiae, we have reviewed the briefs filed in this action. In addition to serving as a "commentary agency" for CEQA purposes over the Friant Ranch project, the Air District has a strong interest in assuring that CEQA is used for its intended purpose, and believes that this Court would benefit from additional briefing explaining the distinction between criteria pollutants and toxic air contaminants and the different methodologies employed by local air pollution control agencies such as the Air District to analyze these two categories of air pollutants under CEQA. The Air District will also explain how the Court of Appeal's opinion is based upon a fundamental misunderstanding of these two different approaches by requiring the County of Fresno to correlate the project's *criteria* pollution emissions with *local* health impacts. In doing

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[6] CEQA does not require speculation. *See, e.g., Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 6 Cal. 4th 1112, 1137 (1993) (upholding EIR that failed to evaluate cumulative toxic air emission increases given absence of any acceptable means for doing so).

so, the Air District will provide helpful analysis to support its position that at least insofar as criteria pollutants are concerned, CEQA does not require an EIR to correlate a project's air quality emissions to specific health impacts, because such an analysis is not reasonably feasible.

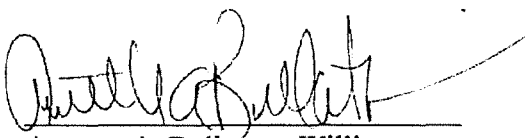
Rule 8.520 Disclosure

Pursuant to Cal. R. 8.520(f)(4), neither the Plaintiffs nor the Defendant or Real Party In Interest or their respective counsel authored this brief in whole or in part. Neither the Plaintiffs nor the Defendant or Real Party in Interest or their respective counsel made any monetary contribution towards or in support of the preparation of this brief.

CONCLUSION

On behalf of the San Joaquin Valley Unified Air Pollution Control District, we respectfully request that this Court accept the filing of the attached brief.

Dated: April 2, 2015



Annette A. Ballatore-Williamson
District Counsel
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CASE NO. S219783

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I. INTRODUCTION.

The San Joaquin Valley Unified Air Pollution Control District ("Air District") respectfully submits that the Court of Appeal erred when it held that the air quality analysis contained in the Environmental Impact Report ("EIR") for the Friant Ranch development project was inadequate under the California Environmental Quality Act ("CEQA") because it did not include an analysis of the correlation between the project's criteria air pollutants and the potential adverse human health impacts. A close reading of the portion of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants and criteria air pollutants.

Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants (hereinafter referred to as "TACs") regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health,

they are distinguishable from TACs and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of TACs occurs solely under section 112 of the Act. *Compare* 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 *with* 42 U.S.C. § 7411.

The most relevant difference between criteria pollutants and TACs for purposes of this case is the manner in which human health impacts are accounted for. While it is common practice to analyze the correlation between an individual facility's TAC emissions and the expected localized human health impacts, such is not the case for criteria pollutants. Instead, the human health impacts associated with criteria air pollutants are analyzed and taken into consideration when EPA sets the national ambient air quality standard ("NAAQS") for each criteria pollutant. 42 U.S.C. § 7409(b)(1). The health impact of a particular criteria pollutant is analyzed on a regional and not a facility level based on how close the area is to complying with (attaining) the NAAQS. Accordingly, while the type of individual facility / health impact analysis that the Court of Appeal has required is a customary practice for TACs, it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task.

It is clear from a reading of both the administrative record and the Court of Appeal's decision that the Court did not have the expertise to fully

appreciate the difference between TACs and criteria air pollutants. As a result, the Court has ordered the County of Fresno to conduct an analysis that is not practicable and not likely yield valid information. The Air District respectfully requests that this portion of the Court of Appeal's decision be reversed.

II. THE COURT OF APPEAL ERRED IN FINDING THE FRIANT RANCH EIR INADEQUATE FOR FAILING TO ANALYZE THE SPECIFIC HUMAN HEALTH IMPACTS ASSOCIATED CRITERIA AIR POLLUTANTS.

Although the Air District does not take lightly the amount of air emissions at issue in this case, it submits that the Court of Appeal got it wrong when it required Fresno County to revise the Friant Ranch EIR to include an analysis correlating the criteria air pollutant emissions associated with the project with specific, localized health-impacts. The type of analysis the Court of Appeal has required will not yield reliable information because currently available modeling tools are not well suited for this task. Further, in reviewing this issue de novo, the Court of Appeal failed to appreciate that it lacked the scientific expertise to appreciate the significant differences between a health risk assessment commonly performed for toxic air contaminants and a similar type of analysis it felt should have been conducted for criteria air pollutants.

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A. Currently Available Modeling Tools are not Equipped to Provide a Meaningful Analysis of the Correlation between an Individual Development Project's Air Emissions and Specific Human Health Impacts.

In order to appreciate the problematic nature of the Court of Appeals' decision requiring a health risk type analysis for criteria air pollutants, it is important to understand how the relevant criteria pollutants (ozone and particulate matter) are formed, dispersed and regulated.

Ground level ozone (smog) is not directly emitted into the air, but is formed when precursor pollutants such as oxides of nitrogen (NOx) and volatile organic compounds (VOCs) are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight.[1] Once formed, ozone can be transported long distances by wind.[2] Because of the complexity of ozone formation, a specific tonnage amount of NOx or VOCs emitted in a particular area does not equate to a particular concentration of ozone in that area. In fact, even rural areas that have relatively low tonnages of emissions of NOx or VOCs can have high levels of ozone concentration simply due to wind transport.[3] Conversely, the San Francisco Bay Area has six times more NOx and VOC emissions per square mile than the San Joaquin Valley, but experiences lower

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[1] *See* United States Environmental Protection Agency, *Ground-level Ozone: Basic Information*, available at: http://www.epa.gov/airquality/ozonepollution/basic.html (visited March 10, 2015).
[2] *Id.*
[3] *Id.*

concentrations of ozone (and better air quality) simply because sea breezes disperse the emissions.[4]

Particulate matter ("PM") can be divided into two categories: directly emitted PM and secondary PM.[5] While directly emitted PM can have a localized impact, the tonnage emitted does not always equate to the local PM concentration because it can be transported long distances by wind.[6] Secondary PM, like ozone, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxides (SOx) and NOx.[7] Because of the complexity of secondary PM formation, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area.

The disconnect between the *tonnage* of precursor pollutants (NOx, SOx and VOCs) and the *concentration* of ozone or PM formed is important because it is not necessarily the tonnage of precursor pollutants that causes human health effects, but the concentration of resulting ozone or PM. Indeed, the national ambient air quality standards ("NAAQS"), which are statutorily required to be set by the United States Environmental Protection

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[4] *San Joaquin Valley Air Pollution Control District 2007 Ozone Plan*, Executive Summary p. ES-6, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/03%20Executive%20Summary.pdf (visited March 10, 2015).

[5] United States Environmental Protection Agency, *Particulate Matter: Basic Information*, available at: http://www.epa.gov/airquality/particlepollution/basic.html (visited March 10, 2015).

[6] *Id.*

[7] *Id.*

Agency ("EPA") at levels that are "requisite to protect the public health," 42 U.S.C. § 7409(b)(1), are established as concentrations of ozone or particulate matter and not as tonnages of their precursor pollutants.[8]

Attainment of a particular NAAQS occurs when the concentration of the relevant pollutant remains below a set threshold on a consistent basis throughout a particular region. For example, the San Joaquin Valley attained the 1-hour ozone NAAQS when ozone concentrations remained at or below 0.124 parts per million Valley-wide on 3 or fewer days over a 3-year period.[9] Because the NAAQS are focused on achieving a particular concentration of pollution region-wide, the Air District's tools and plans for attaining the NAAQS are regional in nature.

For instance, the computer models used to simulate and predict an attainment date for the ozone or particulate matter NAAQS in the San Joaquin Valley are based on regional inputs, such as regional inventories of precursor pollutants (NOx, SOx and VOCs) and the atmospheric chemistry and meteorology of the Valley.[10] At a very basic level, the models simulate future ozone or PM levels based on predicted changes in precursor

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[8] See, e.g., United States Environmental Protection Agency, *Table of National Ambient Air Quality Standards*, available at: http://www.epa.gov/air/criteria.html#3 (visited March 10, 2015).

[9] *San Joaquin Valley Unified Air Pollution Control District 2013 Plan for the Revoked 1-Hour Ozone Standard*, Ch. 2 p. 2-16, available at: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/02Chapter2ScienceTrendsModeling.pdf (visited March 10, 2015).

[10] *Id.* at Ch. 2 p. 2-19 (visited March 12, 2015); *San Joaquin Valley Unified Air Pollution Control District 2008 PM2.5 Plan*, Appendix F, pp. F-2 – F-5, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Final_Adopted_PM2.5/20%20Appendix%20F.pdf (visited March 19, 2015).

emissions Valley wide.[11] Because the NAAQS are set levels necessary to protect human health, the closer a region is to attaining a particular NAAQS, the lower the human health impact is from that pollutant.

The goal of these modeling exercises is not to determine whether the emissions generated by a particular factory or development project will affect the date that the Valley attains the NAAQS. Rather, the Air District's modeling and planning strategy is regional in nature and based on the extent to which *all* of the emission-generating sources in the Valley (current and future) must be controlled in order to reach attainment.[12]

Accordingly, the Air District has based its thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the Valley can accommodate without affecting the attainment date for the NAAQS.[13] The Air District has tied its CEQA significance thresholds to the level at which stationary pollution sources permitted by the Air District must "offset" their emissions.[14] This "offset"

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[11] *Id.*

[12] Although the Air District does have a dispersion modeling tool used during its air permitting process that is used to predict whether a particular project's directly emitted PM will either cause an exceedance of the PM NAAQS or contribute to an existing exceedance, this model bases the prediction on a worst case scenario of emissions and meteorology and has no provision for predicting any associated human health impacts. Further, this analysis is only performed for stationary sources (factories, oil refineries, etc.) that are required to obtain a New Source Review permit from the Air District and not for development projects such as Friant Ranch over which the Air District has no preconstruction permitting authority. *See* San Joaquin Valley Unified Air Pollution Control District Rule 2201 §§ 2.0; 3.3.9; 4.14.1, available at: http://www.valleyair.org/rules/currntrules/Rule2201041l.pdf (visited March 19, 2015).

[13] *San Joaquin Valley Unified Air Pollution Control District Guide to Assessing and Mitigating Air Quality Impacts*, (March 19, 2015) p. 22, available at: http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf (visited March 30, 2015).

[14] *Id.* at pp. 22, 25.

level allows for growth while keeping the cumulative effects of all new sources at a level that will not impede attainment of the NAAQS.[15] In the Valley, these thresholds are 15 tons per year of PM, and 10 tons of NOx or VOC per year. *Sierra Club, supra*, 172 Cal.Rptr.3d at 303; AR 4554. Thus, the CEQA air quality analysis for criteria pollutants is not really a localized, project-level impact analysis but one of regional, "cumulative impacts."

Accordingly, the significance thresholds applied in the Friant Ranch EIR (15 tons per year of PM and 10 tons of NOx or VOCs) are not intended to be indicative of any localized human health impact that the project may have. While the health effects of air pollution are of primary concern to the Air District (indeed, the NAAQS are established to protect human health), the Air District is simply not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual CEQA project directly impact human health in a particular area. This is true even for projects with relatively high levels of emissions of criteria pollutant precursor emissions.

For instance, according to the EIR, the Friant Ranch project is estimated to emit 109.52 tons per year of ROG (VOC), 102.19 tons per year of NOx, and 117.38 tons per year of PM. Although these levels well

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[15] [15] *San Joaquin Valley Unified Air Pollution Control District Environmental Review Guidelines* (Aug. 2000) p. 4-11, available at: http://www.valleyair.org/transportation/CEQA%20Rules/ERG%20Adopted%20_August%202000_.pdf (visited March 12, 2015).

exceed the Air District's CEQA significance thresholds, this does not mean that one can easily determine the concentration of ozone or PM that will be created at or near the Friant Ranch site on a particular day or month of the year, or what specific health impacts will occur. Meteorology, the presence of sunlight, and other complex chemical factors all combine to determine the ultimate concentration and location of ozone or PM. This is especially true for a project like Friant Ranch where most of the criteria pollutant emissions derive not from a single "point source," but from area wide sources (consumer products, paint, etc.) or mobile sources (cars and trucks) driving to, from and around the site.

In addition, it would be extremely difficult to model the impact on NAAQS attainment that the emissions from the Friant Ranch project may have. As discussed above, the currently available modeling tools are equipped to model the impact of *all* emission sources in the Valley on attainment. According to the most recent EPA-approved emission inventory, the NOx inventory for the Valley is for the year 2014 is 458.2 tons per day, or 167,243 tons per year and the VOC (or ROG) inventory is 361.7 tons per day, or 132,020.5 tons per year.[16] Running the photochemical grid model used for predicting ozone attainment with the

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[16] *San Joaquin Valley Unified Air Pollution Control District 2007 Ozone Plan*, Appendix B pp. B-6, B-9,
available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/19%20Appendix%20B%20April%202007.pdf (visited March 12, 2015).

emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NOx and VOC in the Valley) is not likely to yield valid information given the relative scale involved.

Finally, even once a model is developed to accurately ascertain local increases in concentrations of photochemical pollutants like ozone and some particulates, it remains impossible, using today's models, to correlate that increase in concentration to a specific health impact. The reason is the same: such models are designed to determine regional, population-wide health impacts, and simply are not accurate when applied at the local level.

For these reasons, it is not the norm for CEQA practitioners, including the Air District, to conduct an analysis of the localized health impacts associated with a project's criteria air pollutant emissions as part of the EIR process. When the accepted scientific method precludes a certain type of analysis, "the court cannot impose a legal standard to the contrary." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 717 n. 8. However, that is exactly what the Court of Appeal has done in this case. Its decision upends the way CEQA air quality analysis of criteria pollutants occurs and should be reversed.

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B. The Court of Appeal Improperly Extrapolated a Request for a Health Risk Assessment for Toxic Air Contaminants into a Requirement that the EIR contain an Analysis of Localized Health Impacts Associated with Criteria Air Pollutants.

The Court of Appeal's error in requiring the new health impact analysis for criteria air pollutants clearly stems from a misunderstanding of terms of art commonly used in the air pollution field. More specifically, the Court of Appeal (and Appellants Sierra Club et al.) appear to have confused the health risk analysis ("HRA") performed to determine the health impacts associated with a project's toxic air contaminants ("TACs"), with an analysis correlating a project's criteria air pollutants (ozone, PM and the like) with specific localized health impacts.

The first type of analysis, the HRA, is commonly performed during the Air District's stationary source permitting process for projects that emit TACs and is, thus, incorporated into the CEQA review process. An HRA is a comprehensive analysis to evaluate and predict the dispersion of TACs emitted by a project and the potential for exposure of human populations. It also assesses and quantifies both the individual and population-wide health risks associated with those levels of exposure. There is no similar analysis conducted for criteria air pollutants. Thus, the second type of analysis (required by the Court of Appeal), is not currently part of the Air District's process because, as outlined above, the health risks associated

with exposure to criteria pollutants are evaluated on a regional level based on the region's attainment of the NAAQS.

The root of this confusion between the types of analyses conducted for TACs versus criteria air pollutants appears to stem from a comment that was presented to Fresno County by the City of Fresno during the administrative process.

In its comments on the draft EIR, the City of Fresno (the only party to raise this issue) stated:

> [t]he EIR must disclose the human health related effects of the Project's air pollution impacts. (CEQA Guidelines section 15126.2(a).) The EIR fails completely in this area. The EIR should be revised to disclose and determine the significance of TAC impacts, and of human health risks due to exposure to Project-related air emissions.

(AR 4602.)

In determining that the issue regarding the correlation between the Friant Ranch project's criteria air pollutants and adverse health impacts was adequately exhausted at the administrative level, the Court of Appeal improperly read the first two sentences of the City of Fresno's comment in isolation rather than in the context of the entire comment. *See Sierra Club v. County of Fresno* (2014) 172 Cal.Rptr.3d 271, 306. Although the comment first speaks generally in terms of "human health related effects" and "air pollution," it requests only that the EIR be revised to disclose "the significance of TACs" and the "human health risks due to exposure."

The language of this request in the third sentence of the comment is significant because, to an air pollution practitioner, the language would only have indicated only that a HRA for TACs was requested, and not a separate analysis of the health impacts associated with the project's criteria air pollutants. Fresno County clearly read the comment as a request to perform an HRA for TACs and limited its response accordingly. (AR 4602.)[17] The Air District submits that it would have read the City's comment in the same manner as the County because the City's use of the terms "human health risks" and "TACs" signal that an HRA for TACs is being requested. Indeed, the Air District was also concerned that an HRA be conducted, but understood that it was not possible to conduct such an analysis until the project entered the phase where detailed site specific information, such as the types of emission sources and the proximity of the sources to sensitive receptors became available. (AR 4553.)[18] The City of Fresno was apparently satisfied with the County's discussion of human health risks, as it did not raise the issue again when it commented on the final EIR. (AR 8944 – 8960.)

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[17] Appellants do not challenge the manner in which the County addressed TACs in the EIR. (Appellants' Answer Brief p. 28 fn. 7.)

[18] Appellants rely on the testimony of Air District employee, Dan Barber, as support for their position that the County should have conducted an analysis correlating the project's criteria air pollutant emissions with localized health impacts. (Appellants Answer Brief pp. 10-11; 28.) However, Mr. Barber's testimony simply reinforces the Air District's concern that a risk assessment (HRA) be conducted once the actual details of the project become available. (AR 8863.) As to criteria air pollutants, Mr. Barber's comments are aimed at the Air District's concern about the amount of emissions and the fact that the emissions will make it "more difficult for Fresno County and the Valley to reach attainment which means that the health of Valley residents maybe [sic] adversely impacted." Mr. Barber says nothing about conducting a separate analysis of the localized health impacts the project's emissions may have.

The Court of Appeal's holding, which incorrectly extrapolates a request for an HRA for TACs into a new analysis of the localized health impacts of the project's criteria air pollutants, highlights two additional errors in the Court's decision.

First, the Court of Appeal's holding illustrates why the Court should have applied the deferential substantial evidence standard of review to the issue of whether the EIR's air quality analysis was sufficient. The regulation of air pollution is a technical and complex field and the Court of Appeal lacked the expertise to fully appreciate the difference between TACs and criteria air pollutants and tools available for analyzing each type of pollutant.

Second, it illustrates that the Court likely got it wrong when it held that the issue regarding the criteria pollutant / localized health impact analysis was properly exhausted during the administrative process. In order to preserve an issue for the court, '[t]he "exact issue" must have been presented to the administrative agency....' [Citation.] *Citizens for Responsible Equitable Environmental Development v. City of San Diego*, (2011) 196 Cal.App.4th 515, 527 129 Cal.Rptr.3d 512, 521; *Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 535, 78 Cal.Rptr.3d 1, 13. "'[T]he objections must be sufficiently specific so that the agency has the

opportunity to evaluate and respond to them.' [Citation.]" *Sierra Club v. City of Orange*,163 Cal.App.4th at 536.[19]

As discussed above, the City's comment, while specific enough to request a commonly performed HRA for TACs, provided the County with no notice that it should perform a new type of analysis correlating criteria pollutant tonnages to specific human health effects. Although the parties have not directly addressed the issue of failure to exhaust administrative remedies in their briefs, the Air District submits that the Court should consider how it affects the issues briefed by the parties since "[e]xhaustion of administrative remedies is a jurisdictional prerequisite to maintenance of a CEQA action." *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1199, 22 Cal.Rptr.3d 203.

III. CONCLUSION

For all of the foregoing reasons, the Air District respectfully requests that the portion of the Court of Appeal's decision requiring an analysis correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

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[19] *Sierra Club v. City of Orange*, is illustrative here. In that case, the plaintiffs challenged an EIR approved for a large planned community on the basis that the EIR improperly broke up the various environmental impacts by separate project components or "piecemealed" the analysis in violation of CEQA. In evaluating the defense that the plaintiffs had failed to adequately raise the issue at the administrative level, the Court held that comments such as *"the use of a single document for both a project-level and a program-level EIR [is] 'confusing',"* and *"[t]he lead agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project,"* were too vague to fairly raise the argument of piecemealing before the agency. *Sierra Club v. City of Orange*, 163 Cal.App.4th at 537.

correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

Respectfully submitted,

Dated: April 2, 2015

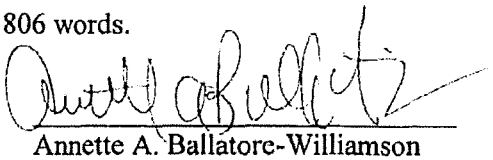
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SAN JOAQUIN VALLEY
UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.204 of the California Rules of Court, I hereby certify that this document, based on the Word County feature of the Microsoft Word software program used to compose and print this document, contains, exclusive of caption, tables, certificate of word count, signature block and certificate of service, 3806 words.

Dated: April 2, 2015



Annette A. Ballatore-Williamson
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Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

PROOF OF SERVICE

I am over the age of 18 years and not a p[arty to the above-captioned action; that my business address is San Joaquin Valley Unified Air Pollution Control District located at 1990 E. Gettysburg Avenue, Fresno, California 93726.

On April 2, 2015, I served the document described below:

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO

On all parties to this action at the following addresses and in the following manner:

PLEASE SEE ATTACHED SERVICE LIST

(XX) **(BY MAIL)** I caused a true copy of each document(s) to be laced in a sealed envelope with first-class postage affixed and placed the envelope for collection. Mail is collected daily at my office and placed in a United State Postal Service collection box for pick-up and delivery that same day.

( ) **(BY ELECTRONIC MAIL)** I caused a true and correct scanned image (.PDF file) copy to be transmitted via electronic mail transfer system in place at the San Joaquin Valley Unified Air Pollution Control District ("District"), originating from the undersigned at 1990 E. Gettysburg Avenue, Fresno, CA, to the address(es) indicated below.

( ) **(BY OVERNIGHT MAIL)** I caused a true and correct copy to be delivered via Federal Express to the following person(s) or their representative at the address(es) listed below.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I executed this document on April 2, 2015, at Fresno, California.

Esthela Soto

SERVICE LIST

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

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S219783

IN THE SUPREME COURT OF C ALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,

Plaintiffs and Appellants,

v.

COUNTY OF FRESNO,

Defendant and Respondent,

and,

FRIANT RANCH, L.P.,

Real Party in Interest and Respondent.

SUPREME COURT
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Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726
Honorable Rosendo A. Pena, Jr.

APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*

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TO THE HONORABLE CHIEF JUSTICE AND JUSTICES OF THE SUPREME COURT:

APPLICATION FOR LEAVE TO FILE *AMICUS CURIAE* BRIEF

Pursuant to Rule 8.520(f) of the California Rules of Court, the South Coast Air Quality Management District (SCAQMD) respectfully requests leave to file the attached *amicus curiae* brief. Because SCAQMD's position differs from that of either party, we request leave to submit this amicus brief in support of neither party.

HOW THIS BRIEF WILL ASSIST THE COURT

SCAQMD's proposed amicus brief takes a position on two of the issues in this case. In both instances, its position differs from that of either party. The issues are:

1) Does the California Environmental Quality Act (CEQA) require an environmental impact report (EIR) to correlate a project's air pollution emissions with specific levels of health impacts?
2) What is the proper standard of review for determining whether an EIR provides sufficient information on the health impacts caused by a project's emission of air pollutants?

This brief will assist the Court by discussing the practical realities of correlating identified air quality impacts with specific health outcomes. In short, CEQA requires agencies to provide detailed information about a project's air quality impacts that is sufficient for the public and decisionmakers to adequately evaluate the project and meaningfully understand its impacts. However, the level of analysis is governed by a rule of reason; CEQA only requires agencies to conduct analysis if it is reasonably feasible to do so.

With regard to health-related air quality impacts, an analysis that correlates a project's air pollution emissions with specific levels of health impacts will be feasible in some cases but not others. Whether it is feasible depends on a variety of factors, including the nature of the project and the nature of the analysis under consideration. The feasibility of analysis may also change over time as air districts and others develop new tools for measuring projects' air quality related health impacts. Because SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, it is uniquely situated to express an opinion on the extent to which the Court should hold that CEQA requires lead agencies to correlate air quality impacts with specific health outcomes.

SCAQMD can also offer a unique perspective on the question of the appropriate standard of review. SCAQMD submits that the proper standard of review for determining whether an EIR is sufficient as an informational document is more nuanced than argued by either party. In our view, this is a mixed question of fact and law. It includes determining whether additional analysis is feasible, which is primarily a factual question that should be reviewed under the substantial evidence standard. However, it also involves determining whether the omission of a particular analysis renders an EIR insufficient to serve CEQA's purpose as a meaningful, informational document. If a lead agency has not determined that a requested analysis is infeasible, it is the court's role to determine whether the EIR nevertheless meets CEQA's purposes, and courts should not defer to the lead agency's conclusions regarding the legal sufficiency of an EIR's analysis. The ultimate question of whether an EIR's analysis is "sufficient" to serve CEQA's informational purposes is predominately a question of law that courts should review de novo.

This brief will explain the rationale for these arguments and may assist the Court in reaching a conclusion that accords proper respect to a lead agency's factual conclusions while maintaining judicial authority over the ultimate question of what level of analysis CEQA requires.

STATEMENT OF INTEREST OF *AMICUS CURIAE*

The SCAQMD is the regional agency primarily responsible for air pollution control in the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of the Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410; Cal. Code Regs., tit. 17, § 60104.) The SCAQMD participates in the CEQA process in several ways. Sometimes it acts as a lead agency that prepares CEQA documents for projects. Other times it acts as a responsible agency when it has permit authority over some part of a project that is undergoing CEQA review by a different lead agency. Finally, SCAQMD also acts as a commenting agency for CEQA documents that it receives because it is a public agency with jurisdiction by law over natural resources affected by the project.

In all of these capacities, SCAQMD will be affected by the decision in this case. SCAQMD sometimes submits comments requesting that a lead agency perform an additional type of air quality or health impacts analysis. On the other hand, SCAQMD sometimes determines that a particular type of health impact analysis is not feasible or would not produce reliable and informative results. Thus, SCAQMD will be affected by the Court's resolution of the extent to which CEQA requires EIRs to correlate emissions and health impacts, and its resolution of the proper standard of review.

CERTIFICATION REGARDING AUTHORSHIP AND FUNDING

No party or counsel in the pending case authored the proposed amicus curiae brief in whole or in part, or made any monetary contribution intended to fund the preparation or submission of the brief. No person or entity other than the proposed *Amicus Curiae* made any monetary contribution intended to fund the preparation or submission of the brief.

Respectfully submitted,

DATED: April 3, 2015

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BRIEF OF AMICUS CURIAE

SUMMARY OF ARGUMENT

The South Coast Air Quality Management District (SCAQMD) submits that this Court should not try to establish a hard-and-fast rule concerning whether lead agencies are required to correlate emissions of air pollutants with specific health consequences in their environmental impact reports (EIR). The level of detail required in EIRs is governed by a few, core CEQA (California Environmental Quality Act) principles. As this Court has stated, "[a]n EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Assn. v. Regents of the Univ of Cal.* (1988) 47 Cal.3d 376, 405 ["*Laurel Heights I*"]) Accordingly, "an agency must use its best efforts to find out and disclose all that it reasonably can." (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 428 (quoting CEQA Guidelines § 15144)[1].). However, "[a]nalysis of environmental effects need not be exhaustive, but will be judged in light of what is reasonably feasible." (*Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1390; CEQA Guidelines §§ 15151, 15204(a).)

With regard to analysis of air quality related health impacts, EIRs must generally quantify a project's pollutant emissions, but in some cases it is not feasible to correlate these emissions to specific, quantifiable health impacts (e.g., premature mortality; hospital admissions). In such cases, a general description of the adverse health impacts resulting from the pollutants at issue may be sufficient. In other cases, due to the magnitude

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[1] The CEQA Guidelines are found at Cal. Code Regs., tit. 14 §§ 15000, *et seq.*

or nature of the pollution emissions, as well as the specificity of the project involved, it may be feasible to quantify health impacts. Or there may be a less exacting, but still meaningful analysis of health impacts that can feasibly be performed. In these instances, agencies should disclose those impacts.

SCAQMD also submits that whether or not an EIR complies with CEQA's informational mandates by providing sufficient, feasible analysis is a mixed question of fact and law. Pertinent here, the question of whether an EIR's discussion of health impacts from air pollution is sufficient to allow the public to understand and consider meaningfully the issues involves two inquiries: (1) Is it feasible to provide the information or analysis that a commenter is requesting or a petitioner is arguing should be required?; and (2) Even if it is feasible, is the agency relying on other policy or legal considerations to justify not preparing the requested analysis? The first question of whether an analysis is feasible is primarily a question of fact that should be judged by the substantial evidence standard. The second inquiry involves evaluating CEQA's information disclosure purposes against the asserted reasons to not perform the requested analysis. For example, an agency might believe that its EIR meets CEQA's informational disclosure standards even without a particular analysis, and therefore choose not to conduct that analysis. SCAQMD submits that this is more of a legal question, which should be reviewed de novo as a question of law.

ARGUMENT

I. RELEVANT FACTUAL AND LEGAL FRAMEWORK.

A. Air Quality Regulatory Background

The South Coast Air Quality Management District (SCAQMD) is one of the local and regional air pollution control districts and air quality

management districts in California. The SCAQMD is the regional air pollution agency for the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410, 17 Cal. Code Reg. § 60104.) The SCAQMD also includes the Coachella Valley in Riverside County (Palm Springs area to the Salton Sea). (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "chapter 7" hyperlink; pp 7-1, 7-3 (last visited Apr. 1, 2015).) The SCAQMD's jurisdiction includes over 16 million residents and has the worst or nearly the worst air pollution levels in the country for ozone and fine particulate matter. (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Executive Summary" hyperlink p. ES-1 (last visited Apr. 1, 2015).)

Under California law, the local and regional districts are primarily responsible for controlling air pollution from all sources except motor vehicles. (Health & Saf. Code § 40000.) The California Air Resources Board (CARB), part of the California Environmental Protection Agency, is primarily responsible for controlling pollution from motor vehicles. (*Id.*) The air districts must adopt rules to achieve and maintain the state and federal ambient air quality standards within their jurisdictions. (Health & Saf. Code § 40001.)

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to identify pollutants that are widely distributed and pose a threat to human health, developing a so-called "criteria" document. (42 U.S.C. § 7408; CAA § 108.) These pollutants are frequently called "criteria pollutants." EPA must then establish "national ambient air quality standards" at levels "requisite to protect public health",

allowing "an adequate margin of safety." (42 U.S.C. § 7409; CAA § 109.) EPA has set standards for six identified pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter (PM), and lead. (U.S. EPA, National Ambient Air Quality Standards (NAAQS), http://www.epa.gov/air/criteria.html (last updated Oct. 21, 2014).)[2]

Under the Clean Air Act, EPA sets emission standards for motor vehicles and "nonroad engines" (mobile farm and construction equipment, marine vessels, locomotives, aircraft, etc.). (42 U.S.C. §§ 7521, 7547; CAA §§ 202, 213.) California is the only state allowed to establish emission standards for motor vehicles and most nonroad sources; however, it may only do so with EPA's approval. (42 U.S.C. §§ 7543(b), 7543(e); CAA §§ 209(b), 209(c).) Sources such as manufacturing facilities, power plants and refineries that are not mobile are often referred to as "stationary sources." The Clean Air Act charges state and local agencies with the primary responsibility to attain the national ambient air quality standards. (42 U.S.C. § 7401(a)(3); CAA § 101(a)(3).) Each state must adopt and implement a plan including enforceable measures to achieve and maintain the national ambient air quality standards. (42 U.S.C. § 7410; CAA § 110.) The SCAQMD and CARB jointly prepare portion of the plan for the South Coast Air Basin and submit it for approval by EPA. (Health & Saf. Code §§ 40460, et seq.)

The Clean Air Act also requires state and local agencies to adopt a permit program requiring, among other things, that new or modified "major" stationary sources use technology to achieve the "lowest achievable emission rate," and to control minor stationary sources as

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[2] Particulate matter (PM) is further divided into two categories: fine particulate or $PM_{2.5}$ (particles with a diameter of less than or equal to 2.5 microns) and coarse particulate (PM_{10}) (particles with a diameter of 10 microns or less). (U.S. EPA, Particulate Matter (PM), http://www.epa.gov/airquality/particlepollution/ (last visited Apr. 1, 2015).)

needed to help attain the standards. (42 U.S.C. §§ 7502(c)(5), 7503(a)(2), 7410(a)(2)(C); CAA §§ 172(c)(5), 173(a)(2), 110(a)(2)(C).) The air districts implement these permit programs in California. (Health & Saf. Code §§ 42300, et seq.)

The Clean Air Act also sets out a regulatory structure for over 100 so-called "hazardous air pollutants" calling for EPA to establish "maximum achievable control technology" (MACT) for sources of these pollutants. (42 U.S.C. § 7412(d)(2); CAA § 112(d)(2).) California refers to these pollutants as "toxic air contaminants" (TACs) which are subject to two state-required programs. The first program requires "air toxics control measures" for specific categories of sources. (Health & Saf. Code § 39666.) The other program requires larger stationary sources and sources identified by air districts to prepare "health risk assessments" for impacts of toxic air contaminants. (Health & Saf. Code §§ 44320(b), 44322, 44360.) If the health risk exceeds levels identified by the district as "significant," the facility must implement a "risk reduction plan" to bring its risk levels below "significant" levels. Air districts may adopt additional more stringent requirements than those required by state law, including requirements for toxic air contaminants. (Health & Saf. Code § 41508; *Western Oil & Gas Assn. v. Monterey Bay Unified APCD* (1989) 49 Cal.3d 408, 414.) For example, SCAQMD has adopted a rule requiring new or modified sources to keep their risks below specified levels and use best available control technology (BACT) for toxics. (SCAQMD, *Rule 1401-New Source Review of Toxic Air Contaminants*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiv; then follow "Rule 1401" hyperlink (last visited Apr. 1, 2015).)

B. The SCAQMD's Role Under CEQA

The California Environmental Quality Act (CEQA) requires public agencies to perform an environmental review and appropriate analysis for projects that they implement or approve. (Pub. Resources Code § 21080(a).) The agency with primary approval authority for a particular project is generally the "lead agency" that prepares the appropriate CEQA document. (CEQA Guidelines §§ 15050, 15051.) Other agencies having a subsequent approval authority over all or part of a project are called "responsible" agencies that must determine whether the CEQA document is adequate for their use. (CEQA Guidelines §§ 15096(c), 15381.) Lead agencies must also consult with and circulate their environmental impact reports to "trustee agencies" and agencies "with jurisdiction by law" including "authority over resources which may be affected by the project." (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines §§ 15086(a)(3), 15073(c).) The SCAQMD has a role in all these aspects of CEQA.

Fulfilling its responsibilities to implement its air quality plan and adopt rules to attain the national ambient air quality standards, SCAQMD adopts a dozen or more rules each year to require pollution reductions from a wide variety of sources. The SCAQMD staff evaluates each rule for any adverse environmental impact and prepares the appropriate CEQA document. Although most rules reduce air emissions, they may have secondary environmental impacts such as use of water or energy or disposal of waste—e.g., spent catalyst from control equipment.[3]

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[3] The SCAQMD's CEQA program for its rules is a "Certified Regulatory Program" under which it prepares a "functionally equivalent" document in lieu of a negative declaration or EIR. (Pub. Resources Code § 21080.5, CEQA Guidelines § 15251(l).)

The SCAQMD also approves a large number of permits every year to construct new, modified, or replacement facilities that emit regulated air pollutants. The majority of these air pollutant sources have already been included in an earlier CEQA evaluation for a larger project, are currently being evaluated by a local government as lead agency, or qualify for an exemption. However, the SCAQMD sometimes acts as lead agency for major projects where the local government does not have a discretionary approval. In such cases, SCAQMD prepares and certifies a negative declaration or environmental impact report (EIR) as appropriate.[4] SCAQMD evaluates perhaps a dozen such permit projects under CEQA each year. SCAQMD is often also a "responsible agency" for many projects since it must issue a permit for part of the projects (e.g., a boiler used to provide heat in a commercial building). For permit projects evaluated by another lead agency under CEQA, SCAQMD has the right to determine that the CEQA document is inadequate for its purposes as a responsible agency, but it may not do so because its permit program already requires all permitted sources to use the best available air pollution control technology. (SCAQMD, *Rule 1303(a)(1) – Requirements*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiii; then follow "Rule 1303" hyperlink (last visited Apr. 1, 2015).)

Finally, SCAQMD receives as many as 60 or more CEQA documents each month (around 500 per year) in its role as commenting agency or an agency with "jurisdiction by law" over air quality—a natural resource affected by the project. (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines § 15366(a)(3).) The SCAQMD staff provides comments on as many as 25 or 30 such documents each month.

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[4] The SCAQMD's permit projects are not included in its Certified Regulatory Program, and are evaluated under the traditional local government CEQA analysis. (Pub. Resources Code §§ 21150-21154.)

(SCAQMD Governing Board Agenda, Apr. 3, 2015, Agenda Item 16, Attachment A, http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-april-3-2015; then follow "16. Lead Agency Projects and Environmental Documents Received by SCAQMD" hyperlink (last visited Apr. 1, 2015).) Of course, SCAQMD focuses its commenting efforts on the more significant projects.

Typically, SCAQMD comments on the adequacy of air quality analysis, appropriateness of assumptions and methodology, and completeness of the recommended air quality mitigation measures. Staff may comment on the need to prepare a health risk assessment detailing the projected cancer and noncancer risks from toxic air contaminants resulting from the project, particularly the impacts of diesel particulate matter, which CARB has identified as a toxic air contaminant based on its carcinogenic effects. (California Air Resources Board, Resolution 98-35, Aug. 27, 1998, http://www.arb.ca.gov/regact/diesltac/diesltac.htm; then follow Resolution 98-35 hyperlink (last visited Apr. 1, 2015).) Because SCAQMD already requires new or modified stationary sources of toxic air contaminants to use the best available control technology for toxics and to keep their risks below specified levels, (SCAQMD Rule 1401, supra, note 15), the greatest opportunity to further mitigate toxic impacts through the CEQA process is by reducing emissions—particularly diesel emissions—from vehicles.

II. THIS COURT SHOULD NOT SET A HARD-AND-FAST RULE CONCERNING THE EXTENT TO WHICH AN EIR MUST CORRELATE A PROJECT'S EMISSION OF POLLUTANTS WITH RESULTING HEALTH IMPACTS.

Numerous cases hold that courts do not review the correctness of an EIR's conclusions but rather its sufficiency as an informative document. (*Laurel Heights 1, supra*, 47 Cal.3d at p. 392; *Citizens of Goleta Valley v.*

Bd. of Supervisors (1990) 52 Cal.3d 553, 569; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1197.)

As stated by the Court of Appeal in this case, where an EIR has addressed a topic, but the petitioner claims that the information provided about that topic is insufficient, courts must "draw[] a line that divides *sufficient* discussions from those that are *insufficient*." (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) The Court of Appeal readily admitted that "[t]he terms themselves – sufficient and insufficient – provide little, if any, guidance as to where the line should be drawn. They are simply labels applied once the court has completed its analysis." (*Id.*)

The CEQA Guidelines, however, provide guidance regarding what constitutes a sufficient discussion of impacts. Section 15151 states that "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." Case law reflects this: "Analysis of environmental effects need not be exhaustive, but will be judged in light of what was reasonably feasible." (*Association of Irritated Residents v. County of Madera, supra,* 107 Cal.App.4th at p. 1390; see also CEQA Guidelines § 15204(a).)

Applying this test, this Court cannot realistically establish a hard-and-fast rule that an analysis correlating air pollution impacts of a project to quantified resulting health impacts is always required, or indeed that it is never required. Simply put, in some cases such an analysis will be "feasible"; in some cases it will not.

For example, air pollution control districts often require a proposed new source of toxic air contaminants to prepare a "health risk assessment" before issuing a permit to construct. District rules often limit the allowable cancer risk the new source may cause to the "maximally exposed individual" (worker and residence exposures). (*See, e.g.*, SCAQMD Rule 1401(c)(8); 1401(d)(1), *supra* note 15.) In order to perform this analysis, it

is necessary to have data regarding the sources and types of air toxic contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence). (SCAQMD, *Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588), pp. 11-16*; (last visited Apr. 1, 2015) http://www.aqmd.gov/home/library/documents-support-material; "Guidelines" hyperlink; AB2588; then follow AB2588 Risk Assessment Guidelines hyperlink.)

Thus, it is feasible to determine the health risk posed by a new gas station locating at an intersection in a mixed use area, where receptor locations are known. On the other hand, it may not be feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)). Even where a health risk assessment can be prepared, however, the resulting maximum health risk value is only a calculation of risk—it does not necessarily mean anyone will contract cancer as a result of the project.

In order to find the "cancer burden" or expected additional cases of cancer resulting from the project, it is also necessary to know the numbers and location of individuals living within the "zone of impact" of the project: i.e., those living in areas where the projected cancer risk from the project exceeds one in a million. (SCAQMD, Health Risk Assessment Summary form, http://www.aqmd.gov/home/forms ; filter by "AB2588" category; then "Health Risk Assessment" hyperlink (last visited Apr. 1, 2015).) The affected population is divided into bands of those exposed to at least 1 in a million risk, those exposed to at least 10 in a million risk, etc. up to those exposed at the highest levels. (*Id.*) This data allows agencies to calculate an approximate number of additional cancer cases expected from

the project. However, it is not possible to predict which particular individuals will be affected.

For the so-called criteria pollutants[5], such as ozone, it may be more difficult to quantify health impacts. Ozone is formed in the atmosphere from the chemical reaction of the nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. (U.S. EPA, Ground Level Ozone, http://www.epa.gov/airquality/ozonepollution/ (last updated Mar. 25, 2015).) It takes time and the influence of meteorological conditions for these reactions to occur, so ozone may be formed at a distance downwind from the sources. (U.S. EPA, *Guideline on Ozone Monitoring Site Selection* (Aug. 1998) EPA-454/R-98-002 § 5.1.2, http://www.epa.gov/ttnamti1/archive/cpreldoc.html (last visited Apr. 1, 2015).) NO_x and VOC are known as "precursors" of ozone.

Scientifically, health effects from ozone are correlated with increases in the ambient level of ozone in the air a person breathes. (U.S. EPA, *Health Effects of Ozone in the General Population,* Figure 9, http://www.epa.gov/apti/ozonehealth/population.html#levels (last visited Apr. 1, 2015).) However, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels over an entire region. For example, the SCAQMD's 2012 AQMP showed that reducing NO_x by 432 tons per day (157,680 tons/year) and reducing VOC by 187 tons per day (68,255 tons/year) would reduce ozone levels at the SCAQMD's monitor site with the highest levels by only 9 parts per billion. (South Coast Air Quality Management District, *Final 2012 AQMP (February 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Appendix V: Modeling & Attainment Demonstrations" hyperlink,

[5] See discussion of types of pollutants, supra, Part I.A.

pp. v-4-2, v-7-4, v-7-24.) SCAQMD staff does not currently know of a way to accurately quantify ozone-related health impacts caused by NO_x or VOC emissions from relatively small projects.

On the other hand, this type of analysis may be feasible for projects on a regional scale with very high emissions of NO_x and VOCs, where impacts are regional. For example, in 2011 the SCAQMD performed a health impact analysis in its CEQA document for proposed Rule 1315, which authorized various newly-permitted sources to use offsets from the districts "internal bank" of emission reductions. This CEQA analysis accounted for essentially *all* the increases in emissions due to new or modified sources in the District between 2010 and 2030.[6] The SCAQMD was able to correlate this very large emissions increase (e.g., 6,620 pounds per day NO_x (1,208 tons per year), 89,180 pounds per day VOC (16,275 tons per year)) to expected health outcomes from ozone and particulate matter (e.g., 20 premature deaths per year and 89,947 school absences in the year 2030 due to ozone).[7] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System* (see hyperlink in fn 6*)* at p. 4.1-35, Table 4.1-29.)

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[6] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, Attachment G, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System, Vol. 1, p.4.0-6,* http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-february-4-2011; the follow "26. Adopt Proposed Rule 1315 – Federal New Source Review Tracking System" (last visited April 1, 2015).)

[7] The SCAQMD was able to establish the location of future NO_x and VOC emissions by assuming that new projects would be built in the same locations and proportions as existing stationary sources. This CEQA document was upheld by the Los Angeles County Superior Court in *Natural Res. Def. Council v SCAQMD*, Los Angeles Superior Court No. BS110792).

However, a project emitting only 10 tons per year of NO_x or VOC is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models that are currently used to determine ozone levels. Thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from ozone. This is in part because ozone formation is not linearly related to emissions. Ozone impacts vary depending on the location of the emissions, the location of other precursor emissions, meteorology and seasonal impacts, and because ozone is formed some time later and downwind from the actual emission. (EPA Guideline on Ozone Monitoring Site Selection (Aug. 1998) EPA-454/R-98-002, § 5.1.2; https://www.epa.gov/ttnamti1/archive/cpreldoc.html; then search "Guideline on Ozone Monitoring Site Selection" click on pdf) (last viewed Apr. 1, 2015).)

SCAQMD has set its CEQA "significance" threshold for NO_x and VOC at 10 tons per year (expressed as 55 lb/day). (SCAQMD, *Air Quality Analysis Handbook*, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook; then follow "SCAQMD Air Quality Significance Thresholds" hyperlink (last visited Apr. 1, 2015).) This is because the federal Clean Air Act defines a "major" stationary source for "extreme" ozone nonattainment areas such as SCAQMD as one emitting 10 tons/year. (42 U.S.C. §§ 7511a(e), 7511a(f); CAA §§ 182(e), 182(f).) Under the Clean Air Act, such sources are subject to enhanced control requirements (42 U.S.C. §§ 7502(c)(5), 7503; CAA §§ 172(c)(5), 173), so SCAQMD decided this was an appropriate threshold for making a CEQA "significance" finding and requiring feasible mitigation. Essentially, SCAQMD takes the position that a source that emits 10 tons/year of NO_x or VOC would contribute cumulatively to ozone formation. Therefore, lead agencies that use SCAQMD's thresholds of significance may determine

that many projects have "significant" air quality impacts and must apply all feasible mitigation measures, yet will not be able to precisely correlate the project to quantifiable health impacts, unless the emissions are sufficiently high to use a regional modeling program.

In the case of particulate matter ($PM_{2.5}$)[8], another "criteria" pollutant, SCAQMD staff is aware of two possible methods of analysis. SCAQMD used regional modeling to predict expected health impacts from its proposed Rule 1315, as mentioned above. Also, the California Air Resources Board (CARB) has developed a methodology that can predict expected mortality (premature deaths) from large amounts of $PM_{2.5}$. (California Air Resources Board, *Health Impacts Analysis: PM Premature Death Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort_arch.htm (last reviewed Jan. 19, 2012).) SCAQMD used the CARB methodology to predict impacts from three very large power plants (e.g., 731-1837 lbs/day). (Final Environmental Assessment for Rule 1315, *supra*, pp 4.0-12, 4.1-13, 4.1-37 (e.g., 125 premature deaths in the entire SCAQMD in 2030), 4.1-39 (0.05 to 1.77 annual premature deaths from power plants.) Again, this project involved large amounts of additional $PM_{2.5}$ in the District, up to 2.82 tons/day (5,650 lbs/day of $PM_{2.5}$, or, or 1029 tons/year. (*Id.* at table 4.1-4, p. 4.1-10.)

However, the primary author of the CARB methodology has reported that this $PM_{2.5}$ health impact methodology is not suited for small projects and may yield unreliable results due to various uncertainties. [9] (SCAQMD, *Final Subsequent Mitigated Negative Declaration for: Warren*

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[8] SCAQMD has not attained the latest annual or 24-hour national ambient air quality standards for "$PM_{2.5}$" or particulate matter less than 2.5 microns in diameter.

[9] Among these uncertainties are the representativeness of the population used in the methodology, and the specific source of PM and the corresponding health impacts. (*Id.* at p. 2-24.)

E&P, Inc. WTU Central Facility, New Equipment Project (certified July 19, 2011), http://www.aqmd.gov/home/library/documents-support-material/lead-agency-permit-projects/permit-project-documents---year-2011; then follow "Final Subsequent Mitigated Negative Declaration for Warren E&P Inc. WTU Central Facility, New Equipment Project" hyperlink, pp. 2-22, 2-23 (last visited Apr. 1, 2015).) Therefore, when SCAQMD prepared a CEQA document for the expansion of an existing oil production facility, with very small $PM_{2.5}$ increases (3.8 lb/day) and a very small affected population, staff elected not to use the CARB methodology for using estimated $PM_{2.5}$ emissions to derive a projected premature mortality number and explained why it would be inappropriate to do so. (*Id.* at pp 2-22 to 2-24.) SCAQMD staff concluded that use of this methodology for such a small source could result in unreliable findings and would not provide meaningful information. (*Id.* at pp. 2-23, 2-25.) This CEQA document was not challenged in court.

In the above case, while it may have been technically possible to plug the data into the methodology, the results would not have been reliable or meaningful. SCAQMD believes that an agency should not be required to perform analyses that do not produce reliable or meaningful results. This Court has already held that an agency may decline to use even the "normal" "existing conditions" CEQA baseline where to do so would be misleading or without informational value. (*Neighbors for Smart Rail v. Exposition Metro Line* (2013) 57 Cal.4th 439, 448, 457.) The same should be true for a decision that a particular study or analysis would not provide reliable or meaningful results.[10]

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[10] Whether a particular study would result in "informational value" is a part of deciding whether it is "feasible." CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and

Therefore, it is not possible to set a hard-and-fast rule on whether a correlation of air quality impacts with specific quantifiable health impacts is required in all cases. Instead, the result turns on whether such an analysis is reasonably feasible in the particular case.[11] Moreover, what is reasonably feasible may change over time as scientists and regulatory agencies continually seek to improve their ability to predict health impacts. For example, CARB staff has been directed by its Governing Board to reassess and improve the methodology for estimating premature deaths. (California Air Resources Board, *Health Impacts Analysis: PM Mortality Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort.htm (last reviewed Dec. 29, 2010).) This factor also counsels against setting any hard-and-fast rule in this case.

III. THE QUESTION OF WHETHER AN EIR CONTAINS SUFFICIENT ANALYSIS TO MEET CEQA'S REQUIREMENTS IS A MIXED QUESTION OF FACT AND LAW GOVERNED BY TWO DIFFERENT STANDARDS OF REVIEW.

A. Standard of Review for Feasibility Determination and Sufficiency as an Informative Document

A second issue in this case is whether courts should review an EIR's informational sufficiency under the "substantial evidence" test as argued by Friant Ranch or the "independent judgment" test as argued by Sierra Club.

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technological factors." (Pub. Resources Code § 21061.1.) A study cannot be "accomplished in a *successful* manner" if it produces unreliable or misleading results.

[11] In this case, the lead agency did not have an opportunity to determine whether the requested analysis was feasible because the comment was non-specific. Therefore, SCAQMD suggests that this Court, after resolving the legal issues in the case, direct the Court of Appeal to remand the case to the lead agency for a determination of whether the requested analysis is feasible. Because Fresno County, the lead agency, did not seek review in this Court, it seems likely that the County has concluded that at least some level of correlation of air pollution with health impacts is feasible.

As this Court has explained, "a reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts." (*Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 435.) For questions regarding compliance with proper procedure or other legal questions, courts review an agency's action de novo under the "independent judgment" test. (*Id.*) On the other hand, courts review factual disputes only for substantial evidence, thereby "accord[ing] greater deference to the agency's substantive factual conclusions." (*Id.*)

Here, Friant Ranch and Sierra Club agree that the case involves the question of whether an EIR includes sufficient information regarding a project's impacts. However, they disagree on the proper standard of review for answering this question: Sierra Club contends that courts use the independent judgment standard to determine whether an EIR's analysis is sufficient to meet CEQA's informational purposes,[12] while Friant Ranch contends that the substantial evidence standard applies to this question.

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[12] Sierra Club acknowledges that courts use the substantial evidence standard when reviewing predicate factual issues, but argues that courts ultimately decide as a matter of law what CEQA requires. (Answering Brief, pp. 14, 23.)

SCAQMD submits that the issue is more nuanced than either party contends. We submit that, whether a CEQA document includes sufficient analysis to satisfy CEQA's informational mandates is a mixed question of fact and law,[13] containing two levels of inquiry that should be judged by different standards.[14]

The state CEQA Guidelines set forth standards for the adequacy of environmental analysis. Guidelines Section 15151 states:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection, but for adequacy, completeness, and a good-faith effort at full disclosure.

In this case, the basic question is whether the underlying analysis of air quality impacts made the EIR "sufficient" as an informative document. However, whether the EIR's analysis was sufficient is judged in light of what was reasonably feasible. This represents a mixed question of fact and law that is governed by two different standards of review.

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[13] Friant Ranch actually states that the claim that an EIR lacks sufficient relevant information is, "most properly thought of as raising mixed questions of fact and law." (Opening Brief, p. 27.) However, the remainder of its argument claims that the court should apply the substantial evidence standard of review to all aspects of the issue.

[14] Mixed questions of fact and law issues may implicate predominantly factual subordinate questions that are reviewed under the substantial evidence test even though the ultimate question may be reviewed by the independent judgment test. *Crocker National Bank v. City and County of San Francisco* (1989) 49 Cal.3d 881, 888-889.

SCAQMD submits that an EIR's sufficiency as an informational document is ultimately a legal question that courts should determine using their independent judgment. This Court's language in *Laurel Heights I* supports this position. As this Court explained: "The court does not pass upon the correctness of the EIR's environmental conclusions, but only upon its *sufficiency as an informative document.*" (*Laurel Heights I, supra,* 47 Cal.3d at 392-393) (emphasis added.) As described above, the Court in *Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 431, also used its independent judgment to determine what level of analysis CEQA requires for water supply impacts. The Court did not defer to the lead agency's opinion regarding the law's requirements; rather, it determined for itself what level of analysis was necessary to meet "[t]he law's informational demands." (*Id.* at p. 432.) Further, existing case law also holds that where an agency fails to comply with CEQA's information disclosure requirements, the agency has "failed to proceed in the manner required by law." (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 118.)

However, whether an EIR satisfies CEQA's requirements depends in part on whether it was reasonably feasible for an agency to conduct additional or more thorough analysis. EIRs must contain "a detailed statement" of a project's impacts (Pub. Res. Code § 21061), and an agency must "use its best efforts to find out and disclose all that it reasonably can." (CEQA Guidelines § 15144.) Nevertheless, "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." (CEQA Guidelines § 15151.)

SCAQMD submits that the question of whether additional analysis or a particular study suggested by a commenter is "feasible" is generally a question of fact. Courts have already held that whether a particular alternative is "feasible" is reviewed by the substantial evidence test.

(*Uphold Our Heritage v. Town of Woodside* (2007) 147 Cal.App.4th 587, 598-99; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866, 883.) Thus, if a lead agency determines that a particular study or analysis is infeasible, that decision should generally be judged by the substantial evidence standard. However, SCAQMD urges this Court to hold that lead agencies must explain the basis of any determination that a particular analysis is infeasible in the EIR itself. An EIR must discuss information, including issues related to the feasibility of particular analyses "in sufficient detail to enable meaningful participation and criticism by the public. '[W]hatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what is lacking in the report.'" (*Laurel Heights I, supra*, 47 Cal.3d at p. 405 (quoting *Santiago County Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 831) (discussing analysis of alternatives).) The evidence on which the determination is based should also be summarized in the EIR itself, with appropriate citations to reference materials if necessary. Otherwise commenting agencies such as SCAQMD would be forced to guess where the lead agency's evidence might be located, thus thwarting effective public participation.

Moreover, if a lead agency determines that a particular study or analysis would not result in reliable or useful information and for that reason is not feasible, that determination should be judged by the substantial evidence test. (See *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority, supra*, 57 Cal.4th 439, 448, 457:

whether "existing conditions" baseline would be misleading or uninformative judged by substantial evidence standard.[15])

If the lead agency's determination that a particular analysis or study is not feasible is supported by substantial evidence, then the agency has not violated CEQA's information disclosure provisions, since it would be infeasible to provide additional information. This Court's decisions provide precedent for such a result. For example, this Court determined that the issue of whether the EIR should have included a more detailed discussion of future herbicide use was resolved because substantial evidence supported the agency's finding that "the precise parameters of future herbicide use could not be predicted." *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936, 955.

Of course, SCAQMD expects that courts will continue to hold lead agencies to their obligations to consult with, and not to ignore or misrepresent, the views of sister agencies having special expertise in the area of air quality. (*Berkeley Keep Jets Over the Bay v. Board of Port Commissioners* (2007) 91 Cal.App.4th 1344, 1364 n.11.) In some cases, information provided by such expert agencies may establish that the purported evidence relied on by the lead agency is not in fact "substantial". (*Id.* at pp. 1369-1371.)

In sum, courts retain ultimate responsibility to determine what CEQA requires. However, the law does not require exhaustive analysis, but only what is reasonably feasible. Agencies deserve deference for their factual determinations regarding what type of analysis is reasonably feasible. On the other hand, if a commenter requests more information, and the lead agency declines to provide it but does *not* determine that the

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[15] The substantial evidence standard recognizes that the courts "have neither the resources nor the scientific expertise" to weigh conflicting evidence on technical issues. (*Laurel Heights I, supra,* 47 Cal.3d 376, 393.)

requested study or analysis would be infeasible, misleading or uninformative, the question becomes whether the omission of that analysis renders the EIR inadequate to satisfy CEQA's informational purposes. (*Id.* at pp. 1370-71.) Again, this is predominantly a question of law and should be judged by the de novo or independent judgment standard of review. Of course, this Court has recognized that a "project opponent or reviewing court can always imagine some additional study or analysis that might provide helpful information. It is not for them to design the EIR. That further study...might be helpful does not make it necessary." (*Laurel Heights I, supra,* 47 Cal.3d 376, 415 – see also CEQA Guidelines § 15204(a) [CEQA "does not require a lead agency to conduct every test. . . recommended or demanded by commenters."].) Courts, then, must adjudicate whether an omission of particular information renders an EIR inadequate to serve CEQA's informational purposes.[16]

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[16] We recognize that there is case law stating that the substantial evidence standard applies to "challenges to the scope of an EIR's analysis of a topic" as well as the methodology used and the accuracy of the data relied on in the document "because these types of challenges involve factual questions." (*Bakersfield Citizens for Local Control v. City of Bakersfield, supra,* 124 Cal.App.4th 1184, 1198, and cases relied on therein.) However, we interpret this language to refer to situations where the question of the scope of the analysis really is factual—that is, where it involves whether further analysis is feasible, as discussed above. This interpretation is supported by the fact that the *Bakersfield* court expressly rejected an argument that a claimed "omission of information from the EIR should be treated as inquiries whether there is substantial evidence supporting the decision approving the project. " *Bakersfield, supra,* 124 Cal.App.4th at p. 1208. And the *Bakersfield* court ultimately decided that the lead agency must analyze the connection between the identified air pollution impacts and resulting health impacts, even though the EIR already included some discussion of air-pollution-related respiratory illnesses. *Bakersfield, supra,* 124 Cal.App.4th at p. 1220. Therefore, the court must not have interpreted this question as one of the "scope of the analysis" to be judged by the substantial evidence standard.

B. Friant Ranch's Rationale for Rejecting the Independent Judgment Standard of Review is Unsupported by Case Law.

In its brief, Friant Ranch makes a distinction between cases where a required CEQA topic is not discussed at all (to be reviewed by independent judgment as a failure to proceed in the manner required by law) and cases where a topic is discussed, but the commenter claims the information provided is insufficient (to be judged by the substantial evidence test). (Opening Brief, pp. 13-17.) The Court of Appeal recognized these two types of cases, but concluded that both raised questions of law. (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) We believe the distinction drawn by Friant Ranch is unduly narrow, and inconsistent with cases which have concluded that CEQA documents are insufficient. In many instances, CEQA's requirements are stated broadly, and the courts must interpret the law to determine what level of analysis satisfies CEQA's mandate for providing meaningful information, even though the EIR discusses the issue to some extent.

For example, the CEQA Guidelines require discussion of the existing environmental baseline. In *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 954-955, the lead agency had discussed the environmental baseline by describing historic month-end water levels in the affected lakes. However, the court held that this was not an adequate baseline discussion because it failed to discuss the timing and amounts of past actual water releases, to allow comparison with the proposed project. The court evidently applied the independent judgment test to its decision, even though the agency discussed the issue to some extent.

Likewise, in *Vineyard Area Citizens* (2007) 40 Cal.4th 412, this Court addressed the question of whether an EIR's analysis of water supply impacts complied with CEQA. The parties agreed that the EIR was required to analyze the effects of providing water to the development project, "and that in order to do so the EIR had, in some manner, to identify the planned sources of that water." (*Vineyard Area Citizens, supra,* at p. 428.) However, the parties disagreed as to the level of detail required for this analysis and "what level of uncertainty regarding the availability of water supplies can be tolerated in an EIR . . . ." (*Id.*) In other words, the EIR had analyzed water supply impacts for the project, but the petitioner claimed that the analysis was insufficient.

This Court noted that neither CEQA's statutory language or the CEQA Guidelines specifically addressed the question of how precisely an EIR must discuss water supply impacts. (*Id.*) However, it explained that CEQA "states that '[w]hile foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.'" (*Id.*, [Guidelines § 15144].) The Court used this general principle, along with prior precedent, to elucidate four "principles for analytical adequacy" that are necessary in order to satisfy "CEQA's informational purposes." (*Vineyard Area Citizens, supra,* at p. 430.) The Court did not defer to the agency's determination that the EIR's analysis of water supply impacts was sufficient. Rather, this Court used its independent judgment to determine for itself the level of analysis required to satisfy CEQA's fundamental purposes. (*Vineyard Area Citizens, supra,* at p. 441: an EIR does not serve its purposes where it neglects to explain likely sources of water and "... leaves long term water supply considerations to later stages of the project.")

Similarly, the CEQA Guidelines require an analysis of noise impacts of the project. (Appendix G, "Environmental Checklist Form."[17]) In *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1123, the court held that the lead agency's noise impact analysis was inadequate even though it had addressed the issue and concluded that the increase would not be noticeable. If the court had been using the substantial evidence standard, it likely would have upheld this discussion.

Therefore, we do not agree that the issue can be resolved on the basis suggested by Friant Ranch, which would apply the substantial evidence standard to *every* challenge to an analysis that addresses a required CEQA topic. This interpretation would subvert the courts' proper role in interpreting CEQA and determining what the law requires.

Nor do we agree that the Court of Appeal in this case violated CEQA's prohibition on courts interpreting its provisions "in a manner which imposes procedural or substantive requirements beyond those explicitly stated in this division or in the state guidelines." (Pub. Resources Code § 21083.1.) CEQA requires an EIR to describe *all* significant impacts of the project on the environment. (Pub. Resources Code § 21100(b)(2); *Vineyard Area Citizens, supra,* at p. 428.) Human beings are part of the environment, so CEQA requires EIRs to discuss a project's significant impacts on human health. However, except in certain particular circumstances,[18] neither the CEQA statute nor Guidelines specify the precise level of analysis that agencies must undertake to satisfy the law's requirements. (see, e.g., CEQA Guidelines § 15126.2(a) [EIRs must describe "health and safety problems caused by {a project's} physical changes"].) Accordingly, courts must interpret CEQA as a whole to

[17] Association of Environmental Professionals, 2015 CEQA Statute and Guidelines (2015) p.287.

[18] E.g., Pub. Resources Code § 21151.8(C)(3)(B)(iii) (requiring specific type of health risk analysis for siting schools).

determine whether a particular EIR is sufficient as an informational document. A court determining whether an EIR's discussion of human health impacts is legally sufficient does not constitute imposing a new substantive requirement.[19] Under Friant Ranch's theory, the above-referenced cases holding a CEQA analysis inadequate would have violated the law. This is not a reasonable interpretation.

IV. COURTS MUST SCRUPULOUSLY ENFORCE THE REQUIREMENTS THAT LEAD AGENCIES CONSULT WITH AND OBTAIN COMMENTS FROM AIR DISTRICTS

Courts must "scrupulously enforce" CEQA's legislatively mandated requirements. (*Vineyard Area Citizens, supra*, 40 Cal.4th 412, 435.) Case law has firmly established that lead agencies must consult with the relevant air pollution control district before conducting an initial study, and must provide the districts with notice of the intention to adopt a negative declaration (or EIR). (*Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 958.) As *Schenck* held, neither publishing the notice nor providing it to the State Clearinghouse was a sufficient substitute for sending notice directly to the air district. (*Id.*) Rather, courts "must be satisfied that [administrative] agencies have fully complied with the procedural requirements of CEQA, since only in this way can the important public purposes of CEQA be protected from subversion." *Schenck,* 198 Cal.App.4th at p. 959 (citations omitted).[20]

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[19] We submit that Public Resources Code Section 21083.1 was intended to prevent courts from, for example, holding that an agency must analyze economic impacts of a project where there are no resulting environmental impacts (see CEQA Guidelines § 15131) , or imposing new procedural requirements, such as imposing additional public notice requirements not set forth in CEQA or the Guidelines.

[20] Lead agencies must consult air districts, as public agencies with jurisdiction by law over resources affected by the project, *before* releasing an EIR. (Pub. Resources Code §§ 21104(a); 21153.) Moreover, air

Lead agencies should be aware, therefore, that failure to properly seek and consider input from the relevant air district constitutes legal error which may jeopardize their project approvals. For example, the court in *Fall River Wild Trout Foundation v. County of Shasta,* (1999) 70 Cal.App.4th 482, 492 held that the failure to give notice to a trustee agency (Department of Fish and Game) was prejudicial error requiring reversal. The court explained that the lack of notice prevented the Department from providing any response to the CEQA document. (*Id.* at p. 492.) It therefore prevented relevant information from being presented to the lead agency, which was prejudicial error because it precluded informed decision-making. (*Id.*)[21]

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districts should be considered "state agencies" for purposes of the requirement to consult with "trustee agencies" as set forth in Public Resources Code § 20180.3(a). This Court has long ago held that the districts are not mere "local agencies" whose regulations are superseded by those of a state agency regarding matters of statewide concern, but rather have concurrent jurisdiction over such issues. (*Orange County Air Pollution Control District v. Public Util. Com.* (1971) 4 Cal.3d 945, 951, 954.) Since air pollution is a matter of statewide concern, *Id* at 952, air districts should be entitled to trustee agency status in order to ensure that this vital concern is adequately protected during the CEQA process.

[21] In *Schenck,* the court concluded that failure to give notice to the air district was not prejudicial, but this was partly because the trial court had already corrected the error before the case arrived at the Court of Appeal. The trial court issued a writ of mandate requiring the lead agency to give notice to the air district. The air district responded by concurring with the lead agency that air impacts were not significant. (*Schenck,* 198 Cal.App.4th 949, 960.) We disagree with the *Schenck* court that the failure to give notice to the air district would not have been prejudicial (even in the absence of the trial court writ) merely because the lead agency purported to follow the air district's published CEQA guidelines for significance. (*Id.*, 198 Cal.App.4th at p. 960.) In the first place, absent notice to the air district, it is uncertain whether the lead agency properly followed those guidelines. Moreover, it is not realistic to expect that an air district's published guidelines would necessarily fully address all possible air-quality related issues that can arise with a CEQA project, or that those

Similarly, lead agencies must obtain additional information requested by expert agencies, including those with jurisdiction by law, if that information is necessary to determine a project's impacts. (*Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236-37.) Approving a project without obtaining that information constitutes a failure to proceed in the manner prescribed by CEQA. (*Id.* at p. 1236.)

Moreover, a lead agency can save significant time and money by consulting with the air district early in the process. For example, the lead agency can learn what the air district recommends as an appropriate analysis on the facts of its case, including what kinds of health impacts analysis may be available, and what models are appropriate for use. This saves the lead agency from the need to do its analysis all over again and possibly needing to recirculate the document after errors are corrected, if new significant impacts are identified. (CEQA Guidelines § 15088.5(a).) At the same time, the air district's expert input can help the lead agency properly determine whether another commenter's request for additional analysis or studies is reasonable or feasible. Finally, the air district can provide input on what mitigation measures would be feasible and effective.

Therefore, we suggest that this Court provide guidance to lead agencies reminding them of the importance of consulting with the relevant air districts regarding these issues. Otherwise, their feasibility decisions may be vulnerable to air district evidence that establishes that there is no substantial evidence to support the lead agency decision not to provide specific analysis. (*See Berkeley Keep Jets Over the Bay, supra,* 91 Cal.App.4th 1344, 1369-1371.)

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guidelines would necessarily be continually modified to reflect new developments. Therefore we believe that, had the trial court not already ordered the lead agency to obtain the air district's views, the failure to give notice would have been prejudicial, as in *Fall River, supra,* 70 Cal.App.4th 482, 492.

CONCLUSION

The SCAQMD respectfully requests this Court *not* to establish a hard-and-fast rule concerning whether CEQA requires a lead agency to correlate identified air quality impacts of a project with resulting health outcomes. Moreover, the question of whether an EIR is "sufficient as an informational document" is a mixed question of fact and law containing two levels of inquiry. Whether a particular proposed analysis is feasible is predominantly a question of fact to be judged by the substantial evidence standard of review. Where the requested analysis is feasible, but the lead agency relies on legal or policy reasons not to provide it, the question of whether the EIR is nevertheless sufficient as an informational document is predominantly a question of law to be judged by the independent judgment standard of review.

Respectfully submitted,

DATED: April 3, 2015

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CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.520(c)(1) of the California Rules of Court, I hereby certify that this brief contains 8,476 words, including footnotes, but excluding the Application, Table of Contents, Table of Authorities, Certificate of Service, this Certificate of Word Count, and signature blocks. I have relied on the word count of the Microsoft Word Vista program used to prepare this Certificate.

DATED: April 3, 2015 Respectfully submitted,

Barbara Baird

Barbara Baird

PROOF OF SERVICE

I am employed in the County of Los Angeles, California. I am over the age of 18 years and not a party to the within action. My business address is 21865 Copley Drive, Diamond Bar, California 91765.

On April 3, 2015 I served true copies of the following document(s) described as **APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*** by placing a true copy of the foregoing document(s) in a sealed envelope addressed as set forth on the attached service list as follows:

BY MAIL: I enclosed the document(s) in a sealed envelope or package addressed to the persons at the addresses listed in the Service List and placed the envelope for collection and mailing following our ordinary business practices. I am readily familiar with this District's practice for collection and processing of correspondence for mailing. Under that practice, the correspondence would be deposited with the United States Postal Service, with postage thereon fully prepaid at Diamond Bar, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on April 3, 2015 at Diamond Bar, California.

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2022 SCOPING PLAN FOR ACHIEVING CARBON NEUTRALITY

NOVEMBER 16, 2022



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Abbreviations

°F	Fahrenheit
°C	Celsius
AB	Assembly Bill
AQMD	Air Quality Management District
AR5	IPCC Fifth Assessment Report
BECCS	bioenergy with carbon capture and storage
CAISO	California Independent System Operator
CalEPA	California Environmental Protection Agency
CalGEM	California Geologic Energy Management Division
CalSTA	California State Transportation Agency
CAP	climate action plan
CARB	California Air Resources Board
CCR	California Code of Regulations
CCS	carbon capture and sequestration
CCUS	carbon capture, utilization, and storage
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CDR	carbon dioxide removal
CE	common era
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CES	CalEnviroScreen
CH_4	methane
CMAQ	Community Multiscale Air Quality
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease

CORE	Clean Off-Road Equipment
CPUC	California Public Utilities Commission
CVM	Climate Vulnerability Metric
DAC	direct air capture
DPR	Department of Pesticide Regulation
Draft EA	Draft Environmental Analysis for this Scoping Plan
EA	Environmental Analysis
ED	emergency department
EIA	U.S. Energy Information Administration
EJ	environmental justice
EJ Advisory Committee	Environmental Justice Advisory Committee
EO	executive order
EV	electric vehicle
F-gas	fluorinated gas
FCEV	fuel cell electric vehicle
GCF	Governors' Climate and Forests Task Force
GDP	gross domestic product
GHG	greenhouse gas
GSP	gross state product
GW	gigawatt
GWh	gigawatt-hour
GWP	global warming potential
HDV	heavy-duty vehicle
HD ZEV	heavy-duty zero-emission vehicle
HFC	hydrofluorocarbon
IBank	Infrastructure and Economic Development Bank
ICE	internal combustion engine
IPCC	Intergovernmental Panel on Climate Change

IPT	incidence-per-ton
IWG	Interagency Working Group
LCFS	low-carbon fuel standard
LDV	light-duty vehicle
MDV	medium-duty vehicle
MMT	million metric tons
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
MOU	memorandum of understanding
MRR	Mandatory Reporting of GHG Emissions
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatt
N_2O	nitrous oxide
NEMS	National Energy Systems Model
NF_3	nitrogen trifluoride
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NRDC	National Resources Defense Council
NWL	Natural and Working Lands
OEHHA	Office of Environmental Health Hazard Assessment
OGV	Ocean-Going Vessel
OPR	Governor's Office of Planning and Research
OTC	once-through cooled
PFC	perfluorocarbon
PHMSA	Pipelines and Hazardous Materials Safety Administration
PM	particulate matter
$PM_{2.5}$	fine particulate matter
PPP	public-private partnership
RFS	renewable fuel standard

ROG	reactive organic gases
RPS	Renewables Portfolio Standard
SB	Senate Bill
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon
SC-GHG	social cost of greenhouse gases
SC-N_2O	social cost of nitrous oxide
SF_6	sulfur hexafluoride
SGIP	Self-Generation Incentive Program
SLCP	short-lived climate pollutant
TSD	Technical Support Document
UC	University of California
UCLA	University of California, Los Angeles
UNFCCC	United Nations Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency
VMT	vehicle miles traveled
WUI	wildland-urban interface
ZEV	zero-emission vehicle

Executive Summary

This Scoping Plan lays out the sector-by-sector roadmap for California, the world's fifth[1] largest economy, to achieve carbon neutrality by 2045 or earlier, outlining a technologically feasible, cost-effective, and equity-focused path to achieve the state's climate target. This is a challenging but necessary goal to minimize the impacts of climate change. There have been three previous Scoping Plans. Previous plans have focused on specific greenhouse gas (GHG) reduction targets for our industrial, energy, and transportation sectors—first to meet 1990 levels by 2020, then to meet the more aggressive target of 40 percent below 1990 levels by 2030. This plan, addressing recent legislation and direction from Governor Newsom, extends and expands upon these earlier plans with a target of reducing anthropogenic emissions to 85 percent below 1990 levels by 2045. This plan also takes the unprecedented step of adding carbon neutrality as a science-based guide and touchstone for California's climate work. The plan outlines how carbon neutrality can be achieved by taking bold steps to reduce GHGs to meet the anthropogenic emissions target and by expanding actions to capture and store carbon through the state's natural and working lands and using a variety of mechanical approaches.

What this means for California is an ambitious and aggressive approach to decarbonize every sector of the economy, setting us on course for a more equitable and sustainable future in the face of humanity's greatest existential threat, and ensuring that those who benefit from this transformation include communities hardest hit by climate impacts and the ongoing pollution from the use of fossil fuels. The combustion of fossil fuels has polluted our air—particularly in low-income communities and communities of color—for far too long and is the root cause of climate change. This Scoping Plan helps us chart the path to a future where race and class are no longer predictors of disproportionate burdens from harmful air pollution and climate impacts.

The major element of this unprecedented transformation is the aggressive reduction of fossil fuels wherever they are currently used in California, building on and accelerating carbon reduction programs that have been in place for a decade and a half. That means rapidly moving to zero-emission transportation; electrifying the cars, buses, trains, and trucks that now constitute California's single largest source of planet-warming pollution. It also means phasing out the use of fossil gas used for heating our homes and buildings. It means clamping down on chemicals and refrigerants that are thousands of times more powerful at trapping heat than carbon dioxide (CO_2). It means providing our communities

[1] In October 2022, California was poised to become the world's fourth largest economy.

with sustainable options for walking, biking, and public transit to reduce reliance on cars and their associated expenses. It means continuing to build out the solar arrays, wind turbine capacity, and other resources that provide clean, renewable energy to displace fossil-fuel fired electrical generation. It also means scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed. Successfully achieving the outcomes called for in this Scoping Plan would reduce demand for liquid petroleum by 94 percent and total fossil fuel by 86 percent in 2045 relative to 2022.[2] Despite these world-leading efforts, some amount of residual emissions will remain from hard-to-abate industries such as cement, internal combustion vehicles still on the road, and other sources of GHGs, including high global warming chemicals used as refrigerants.

The plan addresses these remaining emissions by re-envisioning our natural and working lands—forests, shrublands/chaparral, croplands, wetlands, and other lands—to ensure they play as robust a role as possible in incorporating and storing more carbon in the trees, plants, soil, and wetlands that cover 90 percent of the state's 105 million acres while also thriving as a healthy ecosystem. Modeling indicates that natural and working lands will not, on their own, provide enough sequestration and storage to address the residual emissions. For that reason, it is necessary to research, develop, and deploy additional methods of capturing CO_2 that include pulling it from the smokestacks of facilities, or drawing it out of the atmosphere itself and then safely and permanently utilizing and storing it, as called for in recent legislation. Carbon removal also will be necessary to achieve net negative emissions to address historical GHGs already in the atmosphere.

This is a plan that aims to shatter the carbon status quo and take action to achieve a vision of California with a cleaner, more sustainable environment and thriving economy for our children. This ambitious plan will serve as a model for other partners around the world as they consider how to make their transition. As we have so often in the past, California can continue to serve as a leader in innovation that has produced not only the fifth largest economy on the planet, but ultimately one of the most energy-efficient economies, with a track record of demonstrating the ability to decouple economic growth from carbon pollution. This plan also builds upon current and previous environmental justice efforts to integrate environmental justice directly into the plan, to ensure that all communities can reap the benefits of this transformational plan. Specifically, this plan:

[2] See *https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx* for energy demand reductions.

- Identifies a path to keep California on track to meet its SB 32 GHG reduction target of at least 40 percent below 1990 emissions by 2030.
- Identifies a technologically feasible, cost-effective path to achieve carbon neutrality by 2045 and a reduction in anthropogenic emissions by 85 percent below 1990 levels.
- Focuses on strategies for reducing California's dependency on petroleum to provide consumers with clean energy options that address climate change, improve air quality, and support economic growth and clean sector jobs.
- Integrates equity and protecting California's most impacted communities as driving principles throughout the document.
- Incorporates the contribution of natural and working lands (NWL) to the state's GHG emissions, as well as their role in achieving carbon neutrality.
- Relies on the most up-to-date science, including the need to deploy all viable tools to address the existential threat that climate change presents, including carbon capture and sequestration, as well as direct air capture.
- Evaluates the substantial health and economic benefits of taking action.
- Identifies key implementation actions to ensure success.

The path forward is informed by robust science. The recent Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) summarizes the latest scientific consensus on climate change. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution and continue to increase at a rate of two parts per million each year.[3] By the 2030s, and no later than 2040, the world will exceed 1.5˚C warming unless there is drastic action. While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2˚C warming, compared to 1.5˚C.[4] For example, at 1.5˚C of global warming, we would experience increasing heat waves, longer warm seasons, and shorter cold seasons, but at 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for human health and agriculture.[5] We are already seeing unprecedented climate change impacts, such as continued sea level rise, that are

[3] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. https://www.ipcc.ch/report/ar6/wg1/.

[4] IPCC. 2018. *Global Warming of 1.5°C.* World Meteorological Organization. Geneva, Switzerland. 32 pp. https://www.ipcc.ch/sr15/.

[5] IPCC. 2021. Climate change widespread, rapid, and intensifying – IPCC. August. *https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/.*

"irreversible" for centuries to millennia, and we are dangerously close to hitting 1.5ºC in the near term.[6] To avoid climate catastrophe and remain below 1.5˚C with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to reach net zero by 2050.

It has been 16 years since the Global Warming Solutions Act of 2006 was passed and signed into law. In 2017, the second update to the Assembly Bill (AB) 32 Climate Change Scoping Plan[7] (2017 Scoping Plan) laid out a cost-effective and technologically feasible path to achieve the 2030 GHG reduction target. At the time, many characterized the plan and the AB 32 target as unachievable, citing that it would lead to massive business and job loss, and excessive costs. Those predictions proved to be incorrect as California achieved its AB 32 target years ahead of schedule, all the while growing our economy, with the state distinguishing itself as a hub for green technology investment. This Scoping Plan draws on a decade and a half of proven successes and additional new approaches to provide a balanced and aggressive course of effective actions to achieve carbon neutrality in 2045, if not before, in addition to the 2030 goal.

California's economy is projected to grow vigorously in the coming years and decades. In 2045, under a Reference Scenario, the gross state product would be $5.1 trillion, nearly $2 trillion more than in 2021, and allow growth that would add hundreds of thousands of jobs. Under the Scoping Plan scenario, impacts to economic and job growth would be negligible in both 2035 and 2045, while delivering $199 billion of benefits in the form of reduced hospitalizations, asthma cases, and lost work and school days due to the cleaner air supported by this plan. This should come as no surprise given the tremendous growth of California's economy since the Great Recession of 2007–2009, even as the state has taken drastic measures to lower emissions. As noted, the savings associated with ambitious climate action are extensive, both in terms of avoided climate impacts and health costs. As described in Chapter 1, the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years[8] without robust action. Similarly, the costs of delayed or insufficient climate action could cost the

[6] United Nations. 2021. IPCC report: 'Code red' for human driven global heating, warns UN chief. August 9. *https://news.un.org/en/story/2021/08/1097362.*

[7] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.*

[8] Alwis, D. D., and V. S. Limaye. No date. *The Costs of Inaction: The Economic Burden of Fossil Fuels and Climate Change on Health in the United States.* NRDC, The Medical Society Consortium on Climate and Health, and WHPCA. https://www.nrdc.org/sites/default/files/costs-inaction-burden-health-report.pdf.

U.S. upwards of $14.5 trillion over the next 50 years.[9] We can either take action now or pay the cost of inaction, both now and later.

We cannot take on this unprecedented challenge alone. Collaboration with the federal government, other U.S. states, and other jurisdictions around the world will continue to be fundamental for California to succeed in achieving its climate targets, especially as the pace of our efforts increases in the coming years. We believe this collaboration and coordination also creates a race to the top, encouraging and enabling other jurisdictions to achieve climate and air quality goals as well, and often providing lessons for national action.

One example of fruitful collaboration is California's longstanding vehicle emissions standards programs, which have repeatedly been freely adopted by other states, consistent with the federal Clean Air Act. California's programs frequently pioneer more rigorous standards or new technologies—such as the now-standard catalytic converter and the rules that led directly to the nation-leading numbers of zero-emission vehicles on our roads today. From initial standards for cars and trucks decades ago to the world-leading Advanced Clean Trucks program currently helping to electrify heavy-duty vehicles, this partnership continues to offer regulatory options and spread innovative technologies. A major example of future work is the Advanced Clean Cars II program, which lays out California's legally binding path to achieving 100 percent zero emission vehicle (ZEV) sales in 2035.[10] The California Air Resources Board (CARB) continues to work closely with many other states that also see zero-emission vehicles as critical to their climate and public health goals and expects many states to choose to adopt this regulation as well. This partnership with other states also creates market certainty for automakers, which in turn helps to ensure that California consumers have access to a variety of ZEVs at multiple price points.

The Scoping Plan Process

Four scenarios were extensively modeled to develop this Scoping Plan, with the objective of informing the most viable path to remain on track to achieve our 2030 GHG reduction target: a reduction in anthropogenic emissions by 85% below 1990 levels and carbon neutrality by 2045. All four have their merits and are informed by stakeholder input. The scenario ultimately chosen as the basis of this Scoping Plan is the alternative that most

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[9] Deloitte. 2022. *The Turning Point: A New Economic Climate in the United States.* https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf?id=us:2el:3dp:wsjspon:awa:WSJSBJ:2021:WSJFY22.

[10] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.*

closely aligns with existing statute and Executive Orders. It was selected because it best achieves the balance of cost-effectiveness, health benefits, and technological feasibility.

For the first time, this Scoping Plan includes modeling and quantification of GHG emissions and carbon sequestration in natural and working lands (NWL). To date, the focus has been only on reducing the emissions of GHGs from our transportation, energy, and industrial sectors. The state's 2020 and 2030 GHG reductions targets only include these sources, as they are the primary drivers of climate change and disproportionate harmful air pollution in our vulnerable communities. This Scoping Plan, through the lens of carbon neutrality, expands the scope to more meaningfully consider how our NWL contribute to our long-term climate goals. For the first time, new and cutting-edge modeling tools allow us to estimate the quantitative ability of our forests and other landscapes to remove and store carbon under different scenarios. These cutting-edge tools were developed through a stakeholder process and in coordination with other agencies for the purpose of this update and will continue to be refined over time and made available to others seeking to do similar work.

As recent data and Scoping Plan modeling shows, our NWL also can act as a source of emissions, principally in the form of wildfires. California's forests are experiencing a deadly combination of drought and heat combined with a century of misguided fire suppression management. Scoping Plan modeling shows that, at this time and until our forests reach a balance through appropriate treatments, California's NWL will act as a net source of emissions, not a sink. As such, the Scoping Plan includes policy direction and actions intended to quickly move the sector toward being a net sink and a more natural state, where wildfires will continue to be an important part of the healthy forest cycle but not at the intensity and frequency observed in recent years.

Development of this Scoping Plan also includes careful consideration of, and coordination with, other state agencies, consistent with Governor Gavin Newsom's whole-of-government approach to tackling climate change. State agency plans and regulations, including the SB 100 Joint Agency Report,[11] State Implementation Plan, Climate Action Plan for Transportation Infrastructure,[12] AB 74 Studies on Vehicle Emissions and Fuel

[11] California Public Utilities Commission (CPUC), California Energy Commission (CEC), and CARB. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100.
[12] California State Transportation Agency (CalSTA). 2021. Climate Action Plan for Transportation Infrastructure. https://calsta.ca.gov/subject-areas/climate-action-plan.

Demand and Supply,[13,14,15] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[16] CARB's Achieving Carbon Neutrality Report,[17] Climate Smart Lands Strategy,[18] Natural Working Land Implementation Plan,[19] and the California Climate Insurance Report: *Protecting Communities, Preserving Nature, and Building Resiliency,*[20] among others, provided critical inputs and data points for this plan. This Scoping Plan is the product of work by multiple agencies across the Administration, including dozens of public workshops and years of rigorous analysis and economic modeling by California's leading institutions. This cooperation on planning lays the foundation for even closer coordination among and between state agencies to put the plan into effect.

The plan is also the product of tireless efforts of, and recommendations from, the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee). The EJ Advisory Committee, created by statute, plays a critical role to inform the development of each Scoping Plan and helps to ensure environmental justice is integrated throughout the plan. CARB reconvened the EJ Advisory Committee in early 2021 to advise on the development of this Scoping Plan. In their advisory role, the EJ Advisory Committee has worked together to provide inputs to CARB to inform the development of scenarios and the associated modeling. And in April 2022, the EJ Advisory Committee provided draft preliminary recommendations in advance of the Draft 2022 Scoping Plan to help ensure the draft plan meaningfully addresses environmental justice. The CARB Board and EJ Advisory Committee held a joint board hearing on September 1, 2022, where the EJ Advisory Committee presented their final recommendations on the Scoping Plan. Over five dozen of the recommendations are reflected in the Scoping Plan. Going forward, as this plan is ultimately acted on by the Board, ongoing input from the EJ Advisory

[13] California Environmental Protection Agency (CalEPA). 2021. Carbon Neutrality Studies. https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[14] Brown, A. L., et. al. 2021. *Driving California's Transportation Emissions to Zero.* University of California Institute of Transportation Studies. https://escholarship.org/uc/item/3np3p2t0.
[15] Deschenes, O. 2021. *Enhancing equity while eliminating emissions in California's supply of transportation fuels.* University of California Santa Barbara. https://zenodo.org/record/4707966#.YKPiaKhKi73.
[16] CARB. Short-Lived Climate Pollutants. https://ww2.arb.ca.gov/our-work/programs/slcp.
[17] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for the California Air Resources Board*. October. *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf*.
[18] California Natural Resources Agency (CNRA). 2021. Draft Climate Smart Lands Strategy. *https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions*.
[19] CARB. 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan. https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft*.
[20] California Department of Insurance. 2021. *Protecting Communities, Preserving Nature, and Building Resiliency. climate-insurance-report.pdf (ca.gov)*.

Committee will be essential to address environmental justice and achieve the ambitious vision outlined in the plan throughout its implementation in the coming years.

Importantly, per legislative direction, the Scoping Plan development includes modeling and analyses of emissions, economics, air quality, health, jobs, and public health. This work is important to inform the discussion around trade-offs and how to balance the various legislative direction in identifying a path to achieve the state's climate goals. The technical work serves as a backdrop to what this means to Californian's daily lives—to how they will work, play, and live as we act to eliminate fossil fuel combustion and achieve the many public health and environmental benefits that will result from that action.

Ensuring Equity and Affordability

The state has a long history of public health and environmental protection. However racist and discriminatory practices such as redlining have resulted in low-income communities and communities of color being disproportionately exposed to health hazards and pollution burdens.[21] These communities are often located adjacent to major roadways and large stationary sources that not only emit GHGs, but also harmful localized air pollution. The plan delivers on the promise to transform the way we move, live, and work by nearly eliminating our dependence on fossil fuels. It includes effective actions to move with all possible speed to clean energy, zero-emission cars and trucks, energy-efficient homes, sustainable agriculture, and resilient NWL. And it prioritizes working with the communities most impacted to ensure that these strategies address their needs.

An important part of our equity consideration is ensuring the transition to a zero-emission economy is affordable and accessible, and that it uplifts disadvantaged, low-income communities and communities of color. Some aspects of the transition will have associated costs (e.g., escalating efforts to retrofit existing homes and businesses to support electric appliances and vehicles and increased costs of insurance). The state must ensure that these costs do not disproportionately burden consumers. In addition, the state has an important role to play in providing financial incentives, especially to low-income consumers, to allow for uptake of clean technologies. The Department of Community Services and Development's Low Income Weatherization Program is a prime example of this approach, enabling low-income Californians to be part of the zero-emission transition, all while lowering energy bills. The program provides low-income households with solar photovoltaic systems and energy efficiency upgrades at no cost to residents, helping cushion the impact of climate change on vulnerable communities.

[21] CalEPA. 2021. Pollution and Prejudice: Redlining and Environmental Injustice in California. August 16. *https://storymaps.arcgis.com/stories/f167b251809c43778a2f9f040f43d2f5*.

With this Scoping Plan, the state also adds another tool to help identify and close climate change impact gaps that will emerge over time. As California invests in climate mitigation and adaptation, it is essential to understand the relative impact of climate change across the state's diverse communities. We know not all communities are equally resilient in the face of climate impacts due to persisting health and opportunity gaps. We also know that a global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare.

Energy and Technology Transitions

To support the transformation needed, we must build the clean energy production and distribution infrastructure for a carbon-neutral future. The solution will have to include transitioning existing energy production and transmission infrastructure to produce zero-carbon electricity and hydrogen, and utilizing biogas resulting from wildfire management or landfill and dairy operations, among other substitutes. In almost all sectors, electrification will play an important role. That means that the grid will need to grow at unprecedented rates and ensure reliability, affordability, and resiliency through the next two decades and beyond. It also means we need to keep all options on the table, as it will take time to fully grow the electricity grid to be the backbone for a decarbonized economy. We also know that electrification is not possible in all situations. As such, this plan systematically evaluates and identifies feasible clean energy and technology options that will bring both near-term air quality benefits and deliver on longer-term climate goals.

This transition will not happen overnight. It will take time and planning to ensure a smooth transition of existing energy infrastructure and deployment of new clean technology. And while this Scoping Plan has the longest planning horizon of any Scoping Plan to date, this 25-year horizon is still relatively short in terms of transforming California's economy. We must avoid making choices that will lead to stranded assets and incorporate new technologies that emerge over time. Importantly, given the pace at which we must transition away from fossil fuels, we absolutely must identify and address market and implementation barriers to be successful. The scale of transition includes adding four times the solar and wind capacity by 2045 and about 1,700 times the amount of current hydrogen supply.

As we transition our energy systems, we must also rapidly deploy the clean technologies that rely on a decarbonized grid. As called for in Executive Order N-79-20, all new passenger vehicles sold in California will be zero-emission by 2035, and all other fleets will have transitioned to zero-emission as fully possible by 2045. This means the percentage of fossil fuel combustion vehicles will continue to rapidly decrease, becoming a fading vision of the past. Successful implementation of this Executive Order (EO) and other zero-emission priorities will have to be attractive to consumers. As an example,

electric and hydrogen transportation refueling must be readily accessible, and active transportation and clean transit options must be cheaper and more convenient than driving.

Cost-Effective Solutions Available Today

Ultimately, to achieve our climate goals, urgent efforts are needed to slash GHG emissions. Fortunately, cost-effective solutions are available to do so in many cases. In short, this plan relies on existing technologies—it does not require major technological breakthroughs that are highly uncertain.

For example, targeted action to reduce methane emissions can be achieved at low or negative cost, and with significant near-term climate and public health benefits. In many cases, renewable energy and energy storage are cheaper than polluting alternatives, and are already firmly part of our business-as-usual approach; modeling related to the most recent integrated resource planning process at the California Public Utilities Commission (CPUC) has shown that scenarios associated with the best emissions outcomes had the lowest average rates. As another example, research from Energy Innovation shows that the U.S. can achieve 100 percent zero-carbon power by 2035 without increasing customer costs.[22]

The same is either already true, or soon to be true, for zero-emission vehicles as well. Myriad studies show cost parity for light-duty and heavy-duty ZEVs being achieved by mid-decade or shortly thereafter. A carbon neutrality study conducted by the University of California (UC) Institute of Transportation Studies and funded by the California Environmental Protection Agency (CalEPA) shows that achieving carbon neutrality in the transportation sector will *save* Californians $167 billion through 2045.[23] Similar research from the Goldman School of Public Policy at UC Berkeley finds that achieving 100 percent light-duty ZEV sales nationwide would save consumers $2.7 trillion through 2050; equivalent to $1,000 per household, per year, for 30 years.[24]

Many of these outcomes are a direct result of California's vision and policy development to advance clean energy and climate solutions, including through the Renewables Portfolio Standard, Advanced Clean Cars II regulations, SLCP Reduction Strategy, and

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[22] Phadke, A. et al. 2020. "Illustrative Pathways to 100 Percent Zero Carbon Power by 2035 Without Increasing Customer Costs, Energy Innovation." September. *https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf.*

[23] Brown, A. L., et al. 2021. *Driving California's Transportation Emissions. http://dx.doi.org/10.7922/G2MC8X9X.* Retrieved from https://escholarship.org/uc/item/3np3p2t0.

[24] Goldman School of Public Policy. 2021. *2035: The Report: Transportation.* UC Berkeley. April. *https://www.2035report.com/transportation/.*

others. While the world collectively has not yet fully deployed clean energy and climate solutions at the scale needed to adequately address climate change, California has made tremendous progress—even since the last Scoping Plan update in 2017. Continued ambition, leadership, and climate policy development from California will help the state achieve the scale of emissions reductions needed from technologies and strategies that are already cost-effective or close to it today, and will move additional technologies and strategies to that point in the near future. Achieving those outcomes and reducing costs for the entire array of climate solutions needed to achieve carbon neutrality and then maintain net-negative emissions will prove the true measure of California's success. This will enable California to not just meet our own climate targets, but to ultimately develop the replicable solutions that can scale globally to address global warming.

Continue with a Portfolio Approach

Over the past decade and a half, the state has undertaken a successful three-pronged approach to reducing GHGs: incentives, regulations, and carbon pricing. The 2017 Scoping Plan leveraged existing programs such as the Renewables Portfolio Standard, Advanced Clean Cars, Low Carbon Fuel Standard, Short-lived Climate Pollutant Strategy, mobile source measures to achieve federal air quality targets, and a Cap-and-Trade Program, among others, to lay out a technologically feasible and cost-effective path to achieve the 2030 GHG reduction target. When looking toward the 2045 climate goals and the deeper GHG reductions needed across the AB 32 GHG Inventory sectors, all of the existing programs must be evaluated and, as necessary, strengthened to support the rapid production and deployment of clean technology and energy, as well as the increased pace and scale of actions on our natural and working lands.

The challenge before us requires us to keep all tools on the table. Given the climate mitigation co-benefits, critical actions to deliver near-term air quality benefits, such as those included in the State Implementation Plan to achieve the federal air quality standards, are incorporated into this Scoping Plan, as are new legislative mandates to decarbonize the electricity and cement sectors. And, if additional gaps are identified, new programs and policies must be developed and implemented to ensure all sectors are on track to reduce emissions. Opportunities to leverage these programs to address ongoing air quality disparities must also be considered, along with targeted environmental justice policies such as the AB 617 Community Air Protection Program and the investments made possible through the California Climate Investments Program.

Conclusion

California has never undertaken such a comprehensive, far-reaching, and transformative approach to fighting climate change as that called for in this plan. Once implemented, it will place every aspect of how we live, work, play, and travel in California on a more sustainable footing, with a focus on directly benefitting those communities already most burdened by pollution. This comprehensive approach reflects how climate change is

already changing life in California. We have all experienced the impacts of devastating wildfires, extreme heat, and drought. Despite much progress, California still has some of the worst air pollution in the nation, especially in the San Joaquin Valley and the Los Angeles Basin, which is driven by the continued use of fossil fuel-powered trucks and cars.

This Scoping Plan provides a solution; a way forward and a vision of a California where we can and will address those impacts. This plan is fundamentally based on hope. It is a hope grounded in experience and science that we can fundamentally improve the California we leave to future generations. The plan is built on the legacy of effective actions and on the conviction that we can effectively marshal the combined capabilities of California—from state, regional, tribal, and local governments to industry to our research institutions, and most importantly, to the nearly 40 million Californians who will benefit from the actions laid out in the plan. It addresses the challenge of our generation by laying out a pathway and guideposts for action across three decades. But the Scoping Plan is only that: a plan. The hard work—and hopeful work—is putting its recommendations into action. And there is no time to waste.

Post-adoption of the Scoping Plan

As with previous Scoping Plans, CARB Board approval is the beginning of the next phase of climate action. Specifically, approval of this plan catalyzes a number of efforts, including the development of new regulations as well as amendments to strengthen regulations and programs already in place, not just at CARB but across state agencies. The unprecedented rate of transition will also require the identification and removal of market and implementation barriers to the production and deployment of clean technology and energy. All of these actions and more will be needed if we are to achieve our climate goals.

Chapter 1: Introduction

"The debate is over around climate change. Just come to the state of California. Observe it with your own eyes."

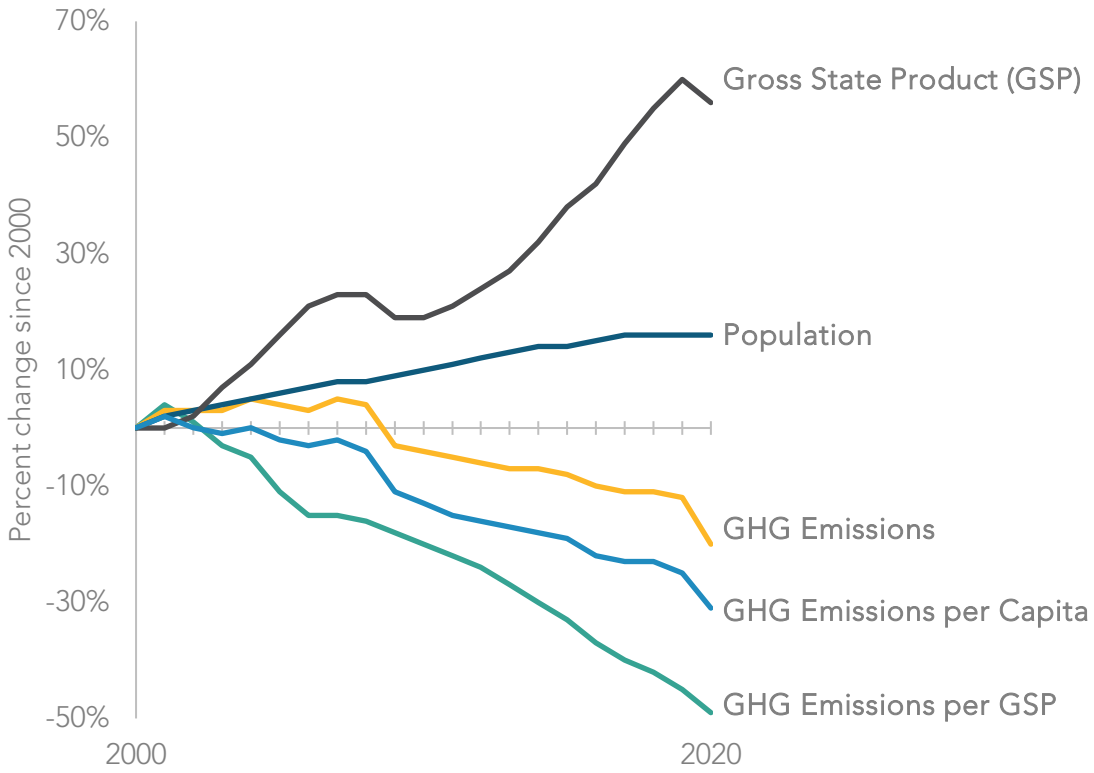
- California Governor Gavin Newsom in September 2020 after surveying the devastation caused by catastrophic wildfires

The impacts of climate change are no longer a distant threat on the horizon—they are right here, right now, with a growing intensity that is adversely affecting our communities and our environment, here in California and across the globe. The science that, decades ago, predicted the impacts we are currently experiencing is even stronger today and unambiguously tells us what we must do to limit irreversible damage: we must act with renewed commitment and focus to do more and do it sooner. That science is indisputable. Unless we increase ambition, we will be faced with more fire, more drought, more temperature extremes, and deadly, choking air pollution. The future of our state—our communities, economy, and ecosystems—is inextricably tied to the way we respond in this decade and the partnerships we forge along the way.

The impacts of climate change fall most heavily on frontline communities that bear the brunt of extreme heat, drought, wildfires, and other effects. Low-income communities and communities of color are also disproportionately impacted by fossil fuel combustion-related air pollution and related health problems. The continued phaseout of fossil fuel combustion will advance both climate and air quality goals and will deliver the greatest health benefits to the most impacted communities.

As it has responded to this climate crisis, California has established itself as a global leader in science-based, public health-focused climate change mitigation and air quality control. The California Legislature has worked with both Republican and Democratic governors to advance action on public health and environmental protections—and California has made progress on addressing climate change during periods of both Republican and Democratic federal administrations. Since the passage of Assembly Bill 32 (AB 32) (Núñez and Pavley, Chapter 488, Statutes of 2006), California has developed bold, creative, and durable policy solutions to protect our environment and public health, all while growing our economy. In fact, California met the target established in AB 32—a return of greenhouse gas (GHG) emissions to 1990 levels by 2020—years ahead of schedule, even as the state established itself as the one of the largest economies in the world. As Figure 1-1 below shows, California's emissions and economic growth have continued to decouple, and California is now the fifth largest economy in the world.

Figure 1-1: California total and per capita GHG emissions[25]



Recognizing both California's early successes in achieving GHG emissions reductions while growing the economy, as well as the worsening impacts of climate change, our governors and legislators have continued to enact ambitious goals. California's unwavering commitment to address climate change is based on indisputable science and data. This commitment is also informed by our collective efforts to address environmental justice and advance racial equity, such that race will no longer be a predictor for disproportionate environmental burdens faced by low-income communities and communities of color. As the Office of Environmental Health Hazard Assessment's

[25] Due to the global pandemic, 2020 is an outlier year and should not be considered indicative of a trend; emissions are likely to increase as economies recover from the impacts of the pandemic.

(OEHHA's) recent analysis of race/ethnicity and air pollution vulnerability and CalEnviroScreen 4.0 scores demonstrate, much work remains to be done.[26]

Many of California's environmental policies have served as models for similar policies in other U.S. states, and at national and international levels. Moving forward, California will continue its pursuit of collaborations and advocacy for action to address climate change at all levels of government. While California is responsible for just one percent of global GHG emissions, and we must do our part, we also play an important role in exporting both political will and technical solutions to address the climate crisis globally.

Today, we have a chance to re-envision California's future and set the state on a path to be carbon neutral no later than 2045 while advancing equity, addressing environmental justice, and continuing to grow our economy. This Scoping Plan provides a roadmap outlining key policies we can implement to achieve our climate goals while improving the health and welfare of Californians and addressing disparities in health outcomes to create a more equitable future. It will enable us to turn the corner in our efforts to protect and preserve our critical natural and public resources, all while providing unparalleled opportunities for clean, pollution-free economic growth.

Severity of Climate Change Impacts

With the increasing severity and frequency of drought, wildfire, extreme heat, and other impacts, Californians just have to look out their windows to know that climate change is real and rapidly getting worse. The impacts we thought we would see in the decades to come are happening now. We must act decisively to both reduce our GHG emissions and build resilience to these impacts for ourselves, future generations, and our iconic landscapes.

Wildfires

Of the twenty largest wildfires ever recorded in California, nine occurred in 2020 and 2021. The worst wildfire season in California's recorded history was in 2018, with over 24,226 structures damaged or destroyed and over 100 lives lost. The largest wildfire season ever recorded in state history was in 2020, where more than 4.3 million acres burned, albeit at different intensity and with varying ecological impacts, and over 112 million metric tons of

[26] OEHHA and CalEPA. 2021. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

carbon dioxide (CO_2) emitted into the atmosphere.[27] The economic damage of these fires was estimated to be over $10 billion in property damage and over $2 billion in fire suppression costs.[28] The Camp Fire, which destroyed much of Paradise, California, was the world's costliest natural disaster in 2018, with overall damages of $16.5 billion.[29] It was also the deadliest fire in California history, with 85 civilian fatalities. Wildfires have always been part of California's natural ecology and will continue to be. However, changes to the state's climate and precipitation expands the footprint of wildfire threat, severity, and intensity, with one quarter of California—more than 25 million acres—now classified as being under very high or extreme fire threat.[30]

The impacts of wildfire smoke have been linked to respiratory infections, cardiac arrests, low birth weight, mental health conditions, and exacerbated asthma and chronic obstructive pulmonary disease.[31] In 2020, with all of California covered by wildfire smoke for over 45 days—and 36 counties for at least 90 days—maximum fine particulate ($PM_{2.5}$) levels persisted in the "hazardous" range of the Air Quality Index for weeks in several areas of the state.[32,33]

Catastrophic wildfire damages extend beyond human health and the economy. The Castle Fire in 2020 and the KNP Complex and Windy Fires in 2021 led to the loss of an unprecedented number of giant sequoias: an estimated 13 to 19 percent of the giant

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[27] CARB. 2020. Public Comment Draft Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed Fire, and Forest Management Activities. *https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf*.

[28] News18. 2021. San Francisco Bay Area Receives its First Wildfire Warning of 2021, After California Concludes its Driest Year. *https://www.news18.com/news/buzz/san-francisco-bay-area-receives-its-first-wildfire-warning-of-2021-after-california-concludes-its-driest-year-3722897.html*.

[29] Munich RE. 2019. Extreme Storms, Wildfires and Droughts Cause Heavy Nat Cat Losses In 2018. *https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2019/2019-01-08-extreme-storms-wildfires-and-droughts-cause-heavy-nat-cat-losses-in-2018.html#-1808457171*.

[30] CARB. No date. Wildfires. *https://ww2.arb.ca.gov/our-work/programs/wildfires/about*.

[31] Reid, C. E., M. Brauer, F. H. Johnston, M. Jerrett, J. R. Balmes, and C. T. Elliott. 2016. "Critical Review of Health Impacts of Wildfire Smoke Exposure." *Environmental Health Perspectives* *http://dx.doi.org/10.1289/ehp.1409277*.

[32] Vargo J. A. 2020 (updated in 2021 using the *NOAA Hazard Mapping System*). "Time Series of Potential US Wildland Fire Smoke Exposures." *Frontiers in Public Health* *https://doi.org/10.3389/fpubh.2020.00126*.

[33] CalFire. 2020 *Fire Siege Report.* *https://www.fire.ca.gov/media/hsviuuv3/cal-fire-2020-fire-siege.pdf*.

sequoia population in the Sierra Nevada. An iconic species, giant sequoias are the largest trees on earth, with exceptional longevity outside of climate extremes.[34,35]

It is clear that we must take drastic measures to prepare for future wildfires, which is why California invested $2.7 billion in wildfire resilience from fiscal years 2020 to 2023. The exponential increase in funding launched more than 552 wildfire resilience projects in less than a year, and CAL FIRE met its 2025 goal of treating 100,000 acres a full three years ahead of schedule. Since Fiscal Year 2019–20, treatment work has significantly increased, and CAL FIRE has averaged 100,000 acres treated each fiscal year.

Although we are making progress, we have a lot more work to do in order to achieve our goal of treating one million acres annually by 2025. The Governor's Wildfire and Forest Resilience Strategy details 99 actions needed to address the key drivers of catastrophic wildfires, ramp up the pace and scale of forest management, and make threatened communities more resilient to catastrophic fires. It is also important to note that natural wildfire cycles are a part of a sustainable forest ecosystem and will continue to play a role in a healthy forests' future. We should not expect wildfires to cease, but we must manage our lands to address catastrophic wildfires that result from buildup of carbon stocks due to our interventions to suppress wildfires and from climate change resulting from fossil fuel combustion.

Drought

Drought is a recurring feature of the California climate that has been intensified by increasingly warmer average temperatures. Anthropogenic climate trends have exacerbated drought conditions; human-caused climate change accounts for 19 percent of drought severity and 42 percent of the soil moisture deficit in this region since 2000. The governor declared a drought state of emergency in October 2021, and as of September 2022, 94 percent of California was in severe drought, and 99.8 percent[36] of the state was in at least moderate drought. The first three months of 2022 were the driest January, February, and March on record in California.[37] The harsh drought conditions affecting California are part of a larger megadrought—a drought lasting more than two

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[34] Shive, K., C. Brigham, T. Caprio, and P. Hardwick. 2021. 2021 Fire Season Impacts to Giant Sequoias. The Nature Conservancy and National Park Service. *https://www.nps.gov/articles/000/2021-fire-season-impacts-to-giant-sequoias.htm*.

[35] Shive, K. L., A. Wuenschel, L. J. Hardlund, S. Morris, M. D. Meyer, and S. M. Hood. 2022. "Ancient Trees and Modern Wildfires: Declining Resilience to Wildfire in the Highly Fire-adapted Giant Sequoia." *Forest Ecology and Management* 511, 120110. *https://doi.org/10.1016/j.foreco.2022.120110*.

[36] Drought.gov. California. National Oceanic and Atmospheric Administration (NOAA) and the National Integrated Drought Information System. *https://www.drought.gov/states/california*.

[37] Drought.ca.gov. September 26, 2022. California Drought Update. *https://drought.ca.gov/media/2022/09/Weekly-CA-Drought-Update-09262022-FINAL.pdf*.

decades—that has been ongoing in the Southwestern region of North America since 2000. The past 22 years have been the region's driest period since at least 800 CE.[38]

While large urban water districts with diversified sources of water supply have maintained water deliveries to customers through the drought, hundreds of individual well owners and some small water systems have suffered disruption. The state is providing funding for water system consolidation and modernization projects in small communities, emergency repairs and replacements for dry wells, and bottled and hauled water deliveries. A 2021 law requires small suppliers to create drought contingency plans. During the drought of the last three years the state has delivered emergency drinking water assistance to nearly 10,000 households and 150 water systems.

California agriculture is responsible for more than half of all U.S. domestic fruit and vegetable production, and in 2021 drought resulted in the fallowing of nearly 400,000 acres of fields.[39] Direct crop revenue losses were approximately $962 million, and total economic impacts were more than $1.7 billion, with over 14,000 full- and part-time job losses.[40] During the 2011–2017 drought, California's agricultural industry suffered at least $5 billion in losses.[41] The 2022–23 budget includes $100 million to support agricultural water conservation practices, provide on-farm technical assistance, and provide direct relief to small farm operators.

Though native California species are adapted to drought, human engineering has altered most streams and wetlands in the state, making drought increasingly stressful to fish and wildlife. The state has conducted hundreds of fish and amphibian rescues in this drought to move creatures from diminished habitat, upgraded hatcheries, and boosted hatchery production, and has hauled millions of young hatchery salmon to San Francisco Bay to avoid adverse river conditions. State biologists monitor dozens of streams statewide and have negotiated voluntary agreements with landowners and water users to improve stream flows and temperatures.

California has started to implement major policies to build resilience to combat drought—such as the Sustainable Groundwater Management Act of 2014, the governor's Water Resilience Portfolio (2020), the governor's Water and Supply Strategy (August 2022), and

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[38] Williams, A. P., B. I. Cook, and J. E. Smerdon. 2022. "Rapid Intensification of The Emerging Southwestern North American Megadrought in 2020–2021." *Nature Climate Change* *https://doi.org/10.1038/s41558-022-01290-z.*

[39] Medellín-Azuara, J. 2022. *Economic Impacts of the 2021 Drought on California Agriculture.* University of California Merced. *https://wsm.ucmerced.edu/wp-content/uploads/2022/02/2021-Drought-Impact-Assessment_20210224.pdf*.

[40] Medellín-Azuara. *Economic Impacts of the 2021 Drought*.

[41] National Resources Defense Council (NRDC). 2019. Climate Change and Health in California. Issue Brief. *https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf*.

new standards for indoor, outdoor, and industrial water use. However, it is crucial that we take further actions to minimize the impacts of drought in the years to come.

Extreme Heat

California's hottest summer on record was 2021.[42] Death Valley recorded the world's highest reliably measured temperature (130°F) in July 2021, breaking its own record (129°F) from summer 2020.[43] Meanwhile, Fresno also broke one of its own records, with 64 days over 100°F in 2021.[44] This is part of a trend: the daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4°F–5.8°F by 2050 and 5.6°F–8.8°F by 2100.[45] Heat waves that result in public health impacts are also projected to worsen throughout the state. By 2050, these heat-related health events are projected to last two weeks longer in the Central Valley and occur four to ten times more often in the Northern Sierra region.[46]

Heat ranks among the deadliest of all climate hazards in California, and heat waves in cities are projected to cause two to three times more heat-related deaths by mid-century.[47] Climate vulnerable communities[48] will experience the worst of these effects, as heat risk is associated and correlated with physical, social, political, and economic factors. Aging populations, infants and children, pregnant people, and people with chronic illness are especially sensitive to heat exposure.[49,50] Combining these characteristics and existing health inequities with additional factors such as poverty, linguistic isolation,

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[42] NOAA. 2022. Climate at a Glance. *https://www.ncdc.noaa.gov/cag/statewide/time-series/4/tavg/3/8/1895-2021?base_prd=true&firstbaseyear=1901&lastbaseyear=2000*.

[43] Masters, J. 2021. Death Valley, California, breaks the all-time world heat record for the second year in a row. Yale Climate Connections. *https://yaleclimateconnections.org/2021/07/death-valley-california-breaks-the-all-time-world-heat-record-for-the-second-year-in-a-row/*.

[44] NOAA. Climate Data Online Search. Accessed on 16 March 2022. *https://www.ncdc.noaa.gov/cdo-web/search*.

[45] Governor's Office of Planning and Research (OPR), CEC, and CNRA. 2018. *California's Fourth Climate Change Assessment*. Page 23. *https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.

[46] OPR, CEC, and CNRA. *California's Fourth Climate Change Assessment - Statewide Summary Report. https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.

[47] Ostro, B., S. Rauch, and S. Green. 2011. "Quantifying the health impacts of future changes in temperature in California." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21975126/*.

[48] CARB. Priority Populations. California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.

[49] Basu, R. 2009. "High Ambient Temperature and Mortality: A Review of Epidemiologic Studies from 2001 to 2008." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/19758453/*.

[50] Basu, R., and B. Malig. 2011. "High Ambient Temperature and Mortality in California: Exploring the Roles of Age, Disease, and Mortality Displacement." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21981982/*.

housing insecurity, and the legacy of racist redlining practices, can put individuals at a disproportionately high risk of heat-related illness and death.[51,52] Rising temperatures will also speed up smog-forming chemical reactions, leading to worse asthma, reduced lung function, cardiac arrest, and cognitive decline. African American, American Indian/Alaskan Native, and Puerto Rican Californians are particularly sensitive to smog, as they are between 28.6 and 132.5 percent more likely to be diagnosed with asthma than white Californians.[53]

In addition to the dangers to public health, California's September 2022 heat wave is particularly illustrative of how more frequent extreme heat strains the state's infrastructure we depend on to adapt to a changing climate. For example, as all-time high temperature records were broken in Sacramento, San Jose, Santa Rosa and Fairfield, electricity demand for air conditioning threatened to overwhelm the state power supply.[54]

California has taken major steps to protect communities from the impacts of extreme heat. Our recent budgets invest $800 million to cool our schools and neighborhoods, including projects to reduce urban overheating. The Extreme Heat Action Plan, released in April 2022, outlines the all-of-government approach California is taking to reduce urgent risks and build long-term resilience to the impacts of extreme heat. In September 2022, Governor Newsom signed multiple bills addressing extreme heat, including AB 2238 (Rivas, Chapter 264, Statutes of 2022), which will create the nation's first extreme heat advance warning and ranking system to better prepare communities ahead of heat waves. The Administration is committed to addressing extreme heat, but we still have a lot of work to do.

Wildfires, drought, and extreme heat are some of the most pronounced climate impacts California is experiencing, but they are not the only ones. Sea level rise, rising ocean temperatures, ocean acidification, and inland flooding are also already having devastating impacts on our communities, ecosystems, and economy, and will continue to do so in the years and decades to come. The decisions and actions that we take today will determine how strongly we will feel the impacts of climate change in the future.

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[51] Hoffman, J. S., V. Shandas, and N. Pendleton. 2020. "The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas." MDPI. *https://www.mdpi.com/2225-1154/8/1/12/htm*.

[52] U.S. Climate Resilience Toolkit. No date. Heat and Social Inequity in the United States. *https://toolkit.climate.gov/tool/heat-and-social-inequity-united-states*.

[53] NRDC. 2019. Climate Change and Health. Issue Brief. *https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf*.

[54] Samenow, Jason. 2022. No September on record in the West has seen a heat wave like this. *The Washington Post.* September 9. *https://www.washingtonpost.com/climate-environment/2022/09/08/western-heatwave-records-california-climate/*.

Imperative To Act

Consequences of Further Warming

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) found that it will not be possible to keep global warming within the threshold of 1.5°C to avoid the most severe impacts of climate change unless we make immediate and large-scale reductions in GHG emissions. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution, and that they continue to increase at a rate of two parts per million each year.[55] Without immediate action, the world will exceed 1.5°C (or 2.7°F) warming by the 2030s, and no later than 2040.

While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2°C (or 3.6°F) warming, compared to 1.5°C.[56] To remain below 1.5°C with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to be cut by about half by 2030 and reach net-zero by 2050.

If we fail to make rapid changes, we may not be able to limit global warming to 2°C,[57] and the consequences of inaction would be catastrophic. Our planet is already 1.2°C warmer than pre-industrial times due to human-induced warming, and many impacts we are already experiencing, such as sea level rise, are "irreversible" for centuries to millennia.[58] Californians with the fewest resources, who are disproportionately low-income communities and communities of color, are the most vulnerable to the impacts of climate change. While the human costs associated with health impacts can never be fully monetized, a recent report finds that the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years.[59]

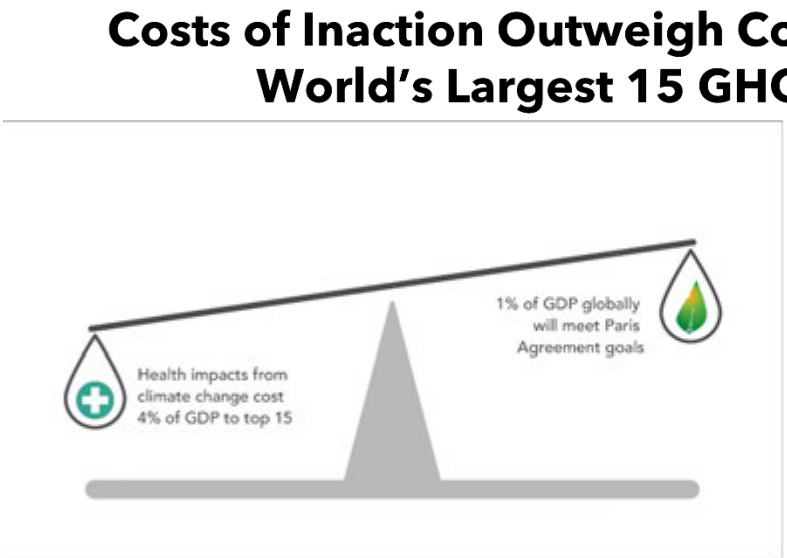
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[55] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[56] IPCC. 2018. *Special Report: Global Warming of 1.5°C.* World Meteorological Organization. https://www.ipcc.ch/sr15/.
[57] IPCC. 2021. Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.
[58] United Nations. 2021. IPCC report: 'Code red.' https://news.un.org/en/story/2021/08/1097362#:~:text=%27Code%20red%20for%20humanity%27&text=We%20are%20at%20imminent%20risk,%2C%20to%20keep%201.5%20alive.%22.
[59] Alwis, D. D., and V. S. Limaye. No date. *The Costs of Inaction*. https://www.nrdc.org/sites/default/files/costs-inaction-burden-health-report.pdf.

Any delays in action or insufficient action are a threat to public health and the environment. The impacts to our economy would be devastating as well. While not specific to California, a 2022 report from Deloitte Economics Institute finds that failing to take sufficient action to reduce emissions could result in economic losses to the U.S. of more than $14.5 trillion over the next 50 years.[60] On a hopeful note, however, the report finds that if the country invests now and in the coming years in a net-zero economy, $3 trillion could be added to the economy over the next 50 years. The U.S. annual gross domestic product (GDP) would be 2.5 percent higher in 2070 in this fast-action scenario than in the delayed action scenario. The lessons for California from these analyses are clear: invest now or pay the price later. As shown in Figure 1-2, inaction can lead to negative consequences for individuals, communities, the economy, and society as a whole. As discussed later, Governor Newsom and the Legislature have accepted this imperative and made significant investments in climate action. This Scoping Plan combined with the historic investments and policy direction from the governor and Legislature, will result in unprecedented action to address the climate crisis.

[60] Deloitte. 2022. *The Turning Point.* *https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf?id=us:2el:3dp:wsjspon:awa:WSJSBJ:2021:WSJFY22*.

Figure 1-2: The real costs of inaction[61]



Exposure to air pollution causes 7 million deaths worldwide every year and costs an estimated US$5.11 trillion in welfare losses globally. In the 15 countries that emit the most greenhouse gas emissions, the health impacts of air pollution are estimated to cost more than 4% of their GDP. Fossil fuel combustion contributes to both air pollution and climate change. Actions to meet the Paris goals would cost about 1% of global GDP.

Scoping Plan Overview

Previous Scoping Plans

The Scoping Plan is a strategy the California Air Resources Board (CARB) develops and updates at least one every five years, as required by AB 32. It lays out the transformations needed across our society and economy to reduce emissions and reach our climate targets. This Scoping Plan is the third update to the original plan that was adopted in 2008. The initial Scoping Plan laid out a path to achieve the AB 32 2020 limit of returning to 1990 levels of GHG emissions, a reduction of approximately 15 percent below business as usual.[62] The 2008 Scoping Plan included a mix of incentives, regulations, and carbon pricing, laying out the portfolio approach to addressing climate change and clearly making the case for using multiple tools to meet California's GHG targets. The 2013 Scoping Plan assessed progress toward achieving the 2020 limit and made the case for addressing

[61] Katowice, P. 2018. *Health benefits far outweigh the costs of meeting climate change goals.* WHO. https://www.who.int/news/item/05-12-2018-health-benefits-far-outweigh-the-costs-of-meeting-climate-change-goals.

[62] CARB. 2008. *Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted_scoping_plan.pdf.

short-lived climate pollutants (SLCPs).[63] The most recent update, the 2017 Scoping Plan,[64] also assessed the progress toward achieving the 2020 limit and provided a technologically feasible and cost-effective path to achieving the Senate Bill 32 (SB 32, Pavley, Chapter 249, Statutes of 2016) target of reducing GHGs by at least 40 percent below 1990 levels by 2030.

Overview of this Scoping Plan

It is paramount that we continue to build on California's success by taking effective actions and doubling down on implementation of the strategies outlined here. As such, this Scoping Plan builds on and integrates efforts already underway to reduce the state's GHG, criteria pollutant, and toxic air contaminant emissions by identifying the clean technologies and fuels that should be phased in as the state transitions away from combustion of fossil fuels. By selecting and pursuing a sustainable and clean economic path, the state will continue to successfully execute existing programs, work to eliminate air pollution inequities, demonstrate the coupling of economic growth and environmental progress, and enhance new opportunities for engagement within the state to address and prepare for climate change.

The 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) is the most comprehensive and far-reaching Scoping Plan developed to date. It identifies a technologically feasible and cost-effective path to achieve carbon neutrality by 2045 while also assessing the progress California is making toward reducing its GHG emissions by at least 40 percent below 1990 levels by 2030, as called for in SB 32 and laid out in the 2017 Scoping Plan.[65] The 2030 target is an interim but important stepping stone along the critical path to the broader goal of deep decarbonization by 2045. Modeling for this Scoping Plan shows that this decade must be one of transformation on a scale never seen before to set us up for success in 2045.

The relatively longer path assessed in this Scoping Plan incorporates, coordinates, and leverages many existing and ongoing efforts to reduce GHGs and air pollution, while identifying new clean technologies and energy. Given the focus on carbon neutrality, this Scoping Plan also includes discussion for the first time of the Natural and Working Lands (NWL) sectors as both sources of emissions and carbon sinks. Chapter 2 of this document

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[63] CARB. 2014. *First Update to the Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.
[64] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.
[65] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.

includes a description of a suite of specific actions to drastically reduce GHGs across all sectors. Chapter 3 provides the air quality and economic evaluations of the actions. Chapter 4 provides a broader description of the many actions needed across all sectors to achieve carbon neutrality. Chapter 5 provides an overview of the next steps and partnerships needed to implement this Scoping Plan. Guided by legislative direction, the actions identified in this Scoping Plan reduce overall GHG emissions in California and deliver policy signals that will continue to drive investment and certainty in a low carbon economy. This Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and subsequent updates while identifying new, technologically feasible, and cost-effective strategies.

Principles That Inform Our Approach to Addressing the Climate Challenge

California has decades of experience addressing the climate challenge. Through this experience, and based on extensive engagement with stakeholders through our regulatory and program development processes, we have developed a set of principles to inform our approach.

Unprecedented Investments in a Sustainable Future

The scale of transformation needed over this decade to avoid the worst impacts of climate change and meet our ambitious climate goals is extraordinary. This is why Governor Newsom and the Legislature invested over $15 billion in climate action through the 2021–2022 California Comeback Plan, and why the 2022–2023 budget marks the beginning of the California Climate Commitment—the governor's multi-year plan to invest $54 billion in climate action. The enacted budgets (Figure 1-3) and the California Climate Commitment represent investments of a historic scale and will advance precisely the type of all-of-government approaches necessary to create the whole-of-society changes described in this Scoping Plan that will enable us to avert the worst impacts of climate change.

Figure 1-3: Comprehensive California climate change investments



The *California Climate Commitment* includes the following game-changing elements:

- $10 billion for zero-emission vehicles (ZEVs), including $1.5 billion for electric school buses to protect students' health and $3 billion to build an accessible charging network. ZEV investments will particularly focus on programs such as heavy-duty vehicle and port electrification that will reduce emissions and protect public health in low-income communities.
- $2.1 billion for clean energy investments, such as long duration storage, offshore wind, green hydrogen,[66] and industrial decarbonization.
- $13.8 billion for programs that reduce emissions from the transportation sector, such as improving public transportation while also funding walking, biking, and adaptation projects.
- Over $720 million for California's higher education institutions and research that will support the next generation of climate innovations.

[66] For the purposes of this Scoping Plan, "renewable hydrogen" and "green hydrogen" are interchangeable and are not limited to only electrolytic hydrogen produced from renewables.

- Nearly $1 billion to build sustainable, affordable housing and over $1 billion to help low-income Californians realize energy cost savings through building decarbonization.
- Nearly $9 billion for wildfire risk reduction, drought mitigation, extreme heat resilience, and nature-based solutions.

These investments are incredibly important in the context of this Scoping Plan in that they accompany and help support implementation of the many policies and regulations that will continue to be necessary to achieve our 2030 and carbon neutrality targets. In addition, these incentive programs jump-start emission reduction strategies for priority sectors, sources, and technologies, leveraging private-sector investment and building sustainable, growing markets for clean and efficient technologies. Many of California's incentive programs work in concert with federal and other state programs to drive emission reductions. As an example, as California pushes to move to 100% sales of new zero emission-vehicles, including plug-in hybrid vehicles, the Newsom Administration continues to invest heavily in incentive programs that allow families, communities, and businesses to choose zero-emission vehicles. This is done while simultaneously working with the federal government, other states, and jurisdictions around the world to align policies, regulations, and incentives, creating market certainty for the automakers that serve our markets.

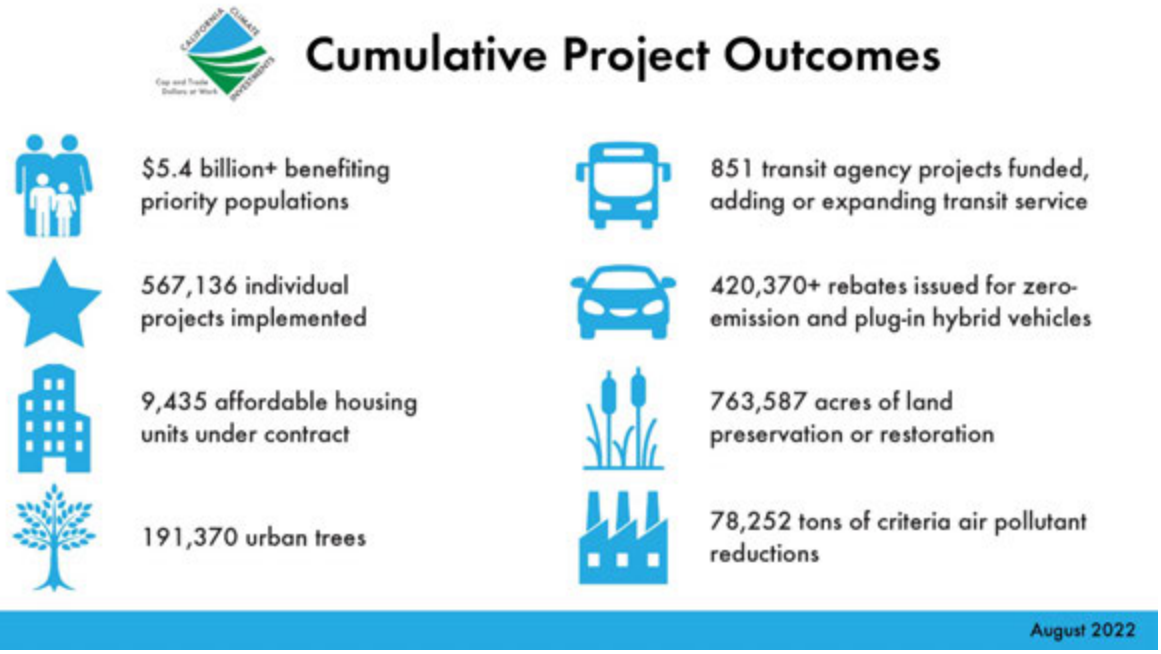
Centering Equity

Prioritizing equity is just as important as the magnitude of the climate investments California is making. Addressing climate change and advancing our equity and economic opportunity goals cannot be decoupled. In line with the governor's Executive Order[67] to take additional actions to embed equity analysis and considerations, this plan works to center equity by addressing disparities for historically underserved and marginalized communities. California strives to ensure that our climate and air research, regulations, investments, and plans include provisions that specifically address and advance equity. This includes reducing and eliminating air pollution disparities, removing barriers that can prevent frontline communities from accessing benefits, lowering costs for low-income Californians, and promoting high-quality jobs. CARB's incentive programs regularly surpass their mandated equity targets, and CARB has incorporated equity-focused provisions in our research, planning, and regulatory efforts. For instance, statute requires that a minimum of 35 percent of California Climate Investments benefit low-income households along with disadvantaged and low-income communities (referred to as *priority*

[67] Executive Department. State of California. 2022. Executive Order N-16-22. *GSS_9320_2-20220912152941 (ca.gov)*.

populations). However, 48 percent—over $5.4 billion—of implemented California Climate Investments project funding is benefiting priority populations, greatly exceeding the statutory minimums (see Figure 1-4). Senate Bill 535 (De León, Chapter 830, Statutes of 2012) and AB 1550 (Gomez, Chapter 369, Statutes of 2016) direct state and local agencies to make significant investments using auction proceeds to assist California's most vulnerable communities. Under these laws, a minimum of 25 percent of the total investments are required to be located within and provide benefits to disadvantaged communities, and at least 10 percent of the total investments must benefit low-income communities and households. Moving forward, the state will continue to devote a greater share of incentive funding to priority populations, with the light-duty vehicle incentive program as just one example. We can simultaneously confront the climate crisis and build a more resilient, just, and equitable future for all communities.

Figure 1-4: California climate investments cumulative outcomes[68,69]



Role of the Environmental Justice Advisory Committee

To inform the development of the Scoping Plan, AB 32 calls for the convening of an Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB in developing the Scoping Plan, and any other pertinent matter in implementing AB 32. It requires that the Committee be comprised of representatives from communities with the most significant exposure to air pollution, including communities with minority populations and/or low-income populations. On January 25, 2007, CARB appointed the first

[68] CARB. 2022. California Climate Investments program implements $10.5 billion in greenhouse gas-reducing programs, expected to reduce 76 million metric tons of emissions. April 11. *https://ww2.arb.ca.gov/news/california-climate-investments-program-implements-105-billion-greenhouse-gas-reducing-projects*.

[69] SB 535 and AB 1550 require investments located in and benefiting low-income communities and households, which are termed *priority populations. Disadvantaged communities* are currently defined by CalEPA as the top 25 percent of communities experiencing disproportionate amounts of pollution, environmental degradation, and socioeconomic and public health conditions according to the Office of Environmental Health Hazard Assessment's *CalEnviroScreen tool,* plus certain additional communities including federally recognized Tribal Lands. Low-income communities and households are defined by statute as those with incomes either at or below 80 percent of the statewide median or below a threshold designated as low-income by the Department of Housing and Community Development.

Environmental Justice Advisory Committee to advise it on the Initial Scoping Plan and other climate change programs.

For this Scoping Plan, CARB reconvened the EJ Advisory Committee in May 2021. The committee is currently comprised of 14 environmental justice and disadvantaged community representatives, including the EJ Advisory Committee's first tribal representative, who was appointed in February 2022. In October 2021, the EJ Advisory Committee formally created eight workgroups. These workgroups are a space for EJ Advisory Committee members to better understand specific sectors of the Scoping Plan and to assist the EJ Advisory Committee in the development of recommendations on this Scoping Plan. In December 2021, the EJ Advisory Committee provided scenario input responses to help shape the modeling for this Scoping Plan. In February 2022, San Joaquin Valley EJ Advisory Committee members hosted their first community workshop, with over 100 attendees. In March 2022, the CARB Board held a joint public meeting with the EJ Advisory Committee to discuss their draft preliminary recommendations for this Scoping Plan. In June 2022, over 165 attendees participated in a statewide community workshop held by EJ Advisory Committee members. The full schedule of EJ Advisory Committee Meetings and meeting materials are available on CARB's website.[70] This Scoping Plan includes references where EJ Advisory Committee Final Recommendations[71] are included in the document. The final recommendations were discussed at a joint CARB and EJ Advisory Committee Hearing on September 1, 2022.

The integration of environmental justice is critical to ensure that certain communities are not left behind. The AB 32 EJ Advisory Committee provided recommendations on September 30 in advance of the final Scoping Plan. There are footnotes to indicate where there is alignment between the AB 32 EJ Advisory Committee's recommendations and this Scoping Plan. While the language in the text may not fully incorporate the specific EJ Advisory Committee's recommendation, the footnotes do acknowledge the places in the text where there is general alignment with the spirit of the EJ Advisory Committee's recommendation.

Partnering with Tribes

[70] CARB. Environmental Justice Advisory Committee Meetings and Events. *https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events*.
[71] Environmental Justice Advisory Committee. September 30, 2022. 2022 Scoping Plan Recommendations. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf*.

There are 109 federally recognized tribes and over 60 non-federally recognized tribes in California.[72] In 2011, Governor Brown issued Executive Order B-10-11, recognizing and reaffirming the inherent right of tribes to exercise sovereign authority over their members and territory and directing state agencies to engage in government-to-government consultation with tribe and to work to develop partnerships and consensus.[73] In 2019, Governor Newsom issued Executive Order N-15-19, which acknowledges and apologizes on behalf of the state for the historical "violence, exploitation, dispossession and the attempted destruction of tribal communities."[74] Establishing partnerships with tribal leaders to incorporate their priorities, traditional expertise, and knowledge will be important to achieving California's climate goals. The Scoping Plan includes actions that tribal partners can voluntarily implement for sources under their jurisdiction (e.g., transitioning to zero emission fleets, installing infrastructure and control technologies, conducting climate smart land management). The Scoping Plan also uplifts the importance of having our tribal partners help guide actions that may impact tribal cultural resources and of benefitting from tribal input.

We also need alignment between state and local partners and tribes on actions related to land-use decisions. This means respecting and reinforcing tribal sovereignty and self-determination. As tribes do not always draw clear lines between the "natural" and "cultural" resources of a place, taking a holistic perspective will result in positive impacts in ability to address the complex issues of land management and regulatory undertakings.

Tribes have an intimate and historical knowledge of places and should be engaged early on to inform planning and future management related to activities that may impact tribal resources and areas including potential funding opportunities, technical assistance, and capacity building, where appropriate. Additionally, tribes should be involved in the identification of their own significant resources and areas of use. As decisions are made related to Scoping Plan undertakings, agencies should recognize and appropriately consider cultural resources and management from the beginning, not as an afterthought; and consider how the project could impact tribes.

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[72] These numbers are subject to change depending on determinations made by the Bureau of Indian Affairs (BIA) and the Native American Heritage Commission (NAHC). Please consult the most current Federal Register for a list of federally recognized tribes and the NAHC for a list of non-federally recognized tribes in California. As of the date of the Scoping Plan, the current list for federally recognized tribes is located at 87 Fed. Reg. 4636 (Jan. 28, 2022).

[73] Executive Order B-10-11. *https://www.ca.gov/archive/gov39/2011/09/19/news17223/index.html#:~:text=EXECUTIVE%20ORDER%20B-10-11%20Published%3A%20Sep%2019%2C%202011%20WHEREAS,and%20affirmed%20in%20state%20and%20federal%20law%3B%20and*.

[74] Executive Order N-15-19. *https://tribalaffairs.ca.gov/wp-content/uploads/sites/10/2020/02/Executive-Order-N-15-19.pdf*.

Finally, to the extent allowed by law, traditional ecological knowledge and culturally sensitive information should be protected, as this is information that may not be common knowledge and may not be known outside the tribe, as each tribe is unique and influenced by its local environment and cultural practices. Protection of this information will help foster productive relationships with tribes and should be included as part of the process. CARB and other agencies should continue to foster relationships with tribal partners.

Maximizing Air Quality and Health Benefits

The state has over 50 years of experience successfully cleaning the air in California by addressing criteria pollutants and toxic air contaminants from mobile and stationary sources. CARB has been a leader in measuring, evaluating, and reducing sources of air pollution that impact public health. Its air pollution programs have been adapted for national programs and emulated in other countries. Significant progress has been made in reducing diesel particulate matter (PM), which is a designated toxic air contaminant, and many other hazardous air pollutants. CARB partners with local air districts to address stationary source emissions and adopts and implements state-level regulations to address sources of criteria and toxic air pollution, including mobile sources. CARB also collaborates with federal agencies to address air pollution from sources primarily under federal jurisdiction. In many instances, actions to reduce fossil fuel combustion and achieve federal air quality standards also help to reduce GHG emissions.

However, air pollution disparities still exist, and more must be done to ensure the most vulnerable populations have safe air to breathe. California must continue to evaluate opportunities to harmonize our climate and air quality programs through innovative policymaking and by building on existing programs like the Low Carbon Fuel Standard (LCFS) and Community Air Protection Program. The LCFS includes a provision that allows electric utilities to opt-in and generate residential electric vehicle (EV) charging credits, where some of the revenues are invested back into rebate programs that address air quality and climate pollution.[75] The Community Air Protection Program[76] is the first of its kind in the country and brings together diverse stakeholders, including CARB, local air districts, and residents of environmental justice communities to increase local air monitoring and develop community-led plans to improve air quality in the communities most impacted by air pollution.

This Scoping Plan identifies actions that will deliver near-term air quality benefits to communities with the highest exposures and provide long-term GHG benefits. Many of the actions in this Scoping Plan are key elements of the 2022 State Strategy for the State

[75] CARB. LCFS Utility Rebate Programs. *https://ww2.arb.ca.gov/resources/documents/lcfs-utility-rebate-programs*.
[76] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.

Implementation Plan to meet federal air quality standards,[77] which has a primary focus of reducing harmful air pollution and achieving federal air quality targets. California's approach of leveraging air quality and GHG policies together has yielded results. A 2022 report by the Office of Environmental Health and Hazard Assessment (OEHHA)[78] that evaluated GHG and harmful air pollution emissions from the heavy-duty vehicle (HDV) and large stationary source sectors found declines in emissions in both sectors, with the greatest declines in disadvantaged communities. Both sectors are subject to state GHG and air quality policies, in addition to federal and local rules on harmful air pollution. Because of historically racist and discriminatory practices such as redlining, both types of sources are disproportionately located adjacent to vulnerable communities, which are predominantly communities of color.[79] The key findings from the OEHHA report are as follows:

- Both HDVs and facilities subject to the Cap-and-Trade Program have reduced emissions of co-pollutants, with HDVs showing a clearer downward trend when compared to stationary sources. These emission reductions have major health benefits, including a reduction in premature pollution-related deaths.
- The greatest beneficiaries of reduced emissions from both HDVs and facilities subject to the Cap-and-Trade Program have been in communities of color and in disadvantaged communities in California, as identified by CalEnviroScreen (CES). This has reduced the emission gap between disadvantaged and non-disadvantaged communities, but a wide gap still remains.
- The transition to zero-emission HDVs will expedite further emissions reductions.
- While the progress observed is encouraging, inequities persist, and federal, state, and local climate and air quality programs must do more to reduce emissions of GHGs and co-pollutants to reduce the burden of emissions on disadvantaged communities and communities of color.

It will take all tools at all levels of government, with robust enforcement, to ensure that vulnerable communities continue to see improvements in air quality until no disparities exist in air pollution across the state.

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[77] CARB. 2022 State Strategy for the State Implementation Plan. *https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy*.
[78] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits within Disadvantaged Communities: Progress Toward Reducing Inequities. https://oehha.ca.gov/environmental-justice/report/ab32-benefits*.
[79] CalEPA. 2021. Pollution and Prejudice. *https://storymaps.arcgis.com/stories/f167b251809c43778a2f9f040f43d2f5*.

Economic Resilience

The state's efforts to tackle the climate crisis will create economic and workforce development opportunities in the clean energy economy in communities across the state. Transitioning existing skills and expanding workforce training opportunities in climate-related fields are critical for reducing harmful emissions and supporting workers in transitioning to new, high-quality jobs. The Administration's recent budgets acknowledge the challenges facing workers in industries most affected by the state's response to climate change—especially those in the fossil fuel industry. It will invest $1 billion in regional partnerships and economic diversification to create new jobs and support a local tax base and workforce transition and development once opportunities are identified. It also will invest in safety nets to protect, and support impacted communities as part of the transition to a carbon neutral economy. Specifically, the Community Economic Resilience Fund Program[80] (CERF) supports communities and regional groups in producing regional roadmaps for economic recovery and transition that prioritize the creation of accessible, high-quality jobs in sustainable industries. The budget investments create the opportunity to future-proof and increase economic resilience in the face of more frequent climate impacts and shifting economic conditions. For these investments and implementation of the Scoping Plan to be successful in supporting the transition to a carbon neutral economy, workers and affected communities must be included in ongoing dialogue to ensure a high-road transition for regional economies.

That state also recognizes it can play a more direct role in supporting a sustainable work force through its incentive programs. In 2021, Assembly Bill 680 (AB 680) (Burke, Chapter 746, Statutes of 2021) was signed into law, requiring CARB to work with the California Labor and Workforce Development Agency to update the Funding Guidelines to include new workforce standards. CARB's Funding Guidelines currently include requirements for administering agencies to, wherever possible, foster job creation within California, provide employment opportunities or job training tied to employment, and target these opportunities to priority populations. The Funding Guidelines also recommend administering agencies prioritize investments in projects that directly support jobs or a job training and placement program, and that they report the estimated employment benefits and employment outcomes for projects that meet specified criteria. These new requirements apply to agencies administering certain California Climate Investments

[80] Office of Planning and Research. Community Economic Resilience Fund. *https://opr.ca.gov/economic-development/cerf/*.

programs that receive continuous appropriations from the Greenhouse Gas Reduction Fund and fall into the following six categories of standards:

- fair and responsible employer standards,
- inclusive procurement policies,
- prevailing wage for construction work,
- community workforce agreements for construction projects over one million dollars,
- preference for projects with educational institutions or training programs, and
- creation of high-quality jobs. CARB will be updating the Funding Guidelines through a public process over the next year to operationalize these new requirements.

Partnering Across Government

The Scoping Plan is an actionable plan to identify and align programs and policies to achieve California's climate targets. To realize the outcomes and deliver results in any Scoping Plan, action is critical. For this Scoping Plan, there are also actions that rely on our federal partners to take on sources primarily under their jurisdiction (such as aviation, and federally owned/managed lands) while they also continue to develop national programs for GHG reductions. The federal government is already taking major steps to advance these types of programs. The Inflation Reduction Act of 2022[81] includes $369 billion for domestic energy production and manufacturing and is expected to lead to U.S. GHG emission reductions of roughly 40 percent by 2030. Direct incentives will include those for clean vehicles and ENERGY STAR appliances, as well as improving transportation and clean energy in underserved communities.

We also need our local partners to align on actions related to land-use decisions that support sustainable, resilient, low-carbon communities and permitting for clean energy production facilities and infrastructure; diversion of organics from landfills; and other climate-related projects. State agencies also should use the Scoping Plan to review and update their own programs and policies to support the actions identified in this Scoping Plan. Importantly, the Scoping Plan also can serve as a resource as the Legislature considers new legislative direction and funding to support the state's path to carbon neutrality and continue action to address near-term air pollution disparities.

Partnering with the Private Sector

Government cannot achieve our climate targets alone. The scale of investment needed requires both private-sector investment and partnerships with philanthropies. Public

[81] Pub.L. No. 117-169 (August 16, 2022).

sector dollars, accompanied by strong and steady policy signals, must be a catalyst for deeper and broader investments by the private sector in both reducing emissions and building the resilience of our communities. Governor Newsom is committed to working collaboratively with businesses, including small businesses, to deploy the technologies, capital, and ingenuity that are hallmarks of the private sector.

California structures our climate policies and regulations to create market signals and certainty that spur private sector investment. For example, the Governor's Executive Order on Zero-Emission Vehicles[82] set 2035 as the target year for 100 percent zero-emission vehicle sales, creating a time horizon that allows automakers to scale up zero-emission fleets and sending a clear signal to the companies and utilities that would deploy charging infrastructure. The Executive Order has been followed by development and adoption of the Advanced Clean Cars II regulation. CARB convened auto manufacturers, environmental justice groups, labor organizations, and many other stakeholders to provide input into development of the regulation in a robust and transparent manner; again, with the aim of providing certainty for producers and consumers.

California also pursues public-private partnerships (PPP) as a mechanism to advance our collective climate goals. We know these vehicles can be effective at increasing the impact of public sector dollars and helpful in moving markets in a direction aligned with state policy. A new PPP the Administration is advancing is the Climate Catalyst Revolving Loan Fund, housed at the state's Infrastructure and Economic Development Bank (IBank). The fund offers a range of financial instruments—including flexible credit and credit support—to help bridge financing gaps currently preventing advanced climate solutions from scaling in the marketplace. The Catalyst Fund's initial areas of investment include forest biomass management and utilization (unlocking innovation to reduce wildfire threats), climate-smart agriculture, and clean energy transmission. The fund leverages public sector investments by mobilizing private finance for shovel-ready projects that are stuck in the deployment phase. As such, IBank is ideally positioned as the state's all-purpose "Green Bank," with increasing connection to federal financing programs such as US DOE's Loan Programs Office and the United States Environmental Protection Agency's (U.S. EPA) Greenhouse Gas Reduction Fund.

The Catalyst Fund builds from existing IBank financing programs that are themselves increasingly focused on the climate imperative. The IBank's Infrastructure State Revolving Fund provides supportive capital to climate-aligned projects promoted by local governments and certain nonprofit entities, and will be refining its criteria and market outreach strategies to increase its level of service. IBank's bonds program has supported

[82] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.*

multiple large environmental projects, including more than $2 billion in “green bonds,” and is poised to help expand access to the state’s deep and liquid bond capital market. Within IBank’s Small Business Finance Center, the new Climate Tech Loan Guarantee program encourages commercial banks to back climate-focused small businesses, leveraging federal capital to insure a portion of the private bank’s loan. And through IBank’s Expanding Venture Capital Access Fund program, the state is promoting greater diversity in the venture capital community, including climate equity and climate justice.

All of these financing programs exist to leverage private capital in support of the state’s climate goals, and to partner with state policy agencies driving the transition. IBank will also continue to collaborate closely with the State Treasurer’s Office in its provision of capital support to climate solutions, ensuring that funding flows to programs best positioned to deliver success. This partnership of public and private capital, responsive to and in communication with the climate policy community, will ensure that California gets the maximum possible benefit from its allocation of scarce resources.

Supporting Innovation

Reaching our ambitious, deep decarbonization goals will require continued technological innovation. Investment in research, development, and deployment of clean technologies has never been more critical. Sending clear and sustained market and policy signals will encourage large and small companies alike to pursue innovation that can be scaled up and deployed here and beyond our borders. The full suite of AB 32 policies[83] has touched nearly every sector of California’s economy and spurred technology innovation in the state, including the growth of technology developers, manufacturers, processors, and assemblers in many areas. Specifically, AB 32 policies and programs support both the supply side and the demand side to build new markets in California. On the supply side, AB 32 policies support businesses to demonstrate and refine technologies, and to help establish critical supply chains. On the demand side, AB 32 policies and programs provide outreach, education, and incentives—as well as disincentives—to motivate everyone from consumers to institutional purchasers to utility planners to adopt new, climate smart technologies. Innovations resulting directly from the state’s climate policies include the following:

- In the past 10 years, a growing market for heavy-duty zero-emission vehicles (HD ZEVs) was established in California, and this market now represents the largest single share of North American supply and demand for HD ZEVs. Vehicle

[83] CARB. Climate Change Programs. *https://ww2.arb.ca.gov/our-work/topics/climate-change*.

and component manufacturers are making long-term investments to develop and produce HD ZEVs within California.

- Total consumption of renewable diesel in the California LCFS market has skyrocketed from approximately 1.8 million gallons in 2011 to nearly 589 million gallons in 2020. The LCFS is a key driver of market development for renewable diesel and its coproducts. While the federal renewable fuel standard (RFS) and blenders tax credit also benefit producers, an analysis of their respective contributions to market development, and interviews with industry representatives and independent experts, point to LCFS as a more important factor in market development, at least in recent years.
- In the past five years, a market for small-scale energy storage in California was created where none previously existed. As of 2020, 185 megawatts (MW) of small-scale energy storage projects have been interconnected to the grid. The significant increase in deployment in the last five years is a result of the Self-Generation Incentive Program (SGIP), which significantly reduces the upfront costs to purchase and install small-scale energy storage devices, and of growing customer interest in disaster resiliency in the face of increasing risk from wildfire and related utility outages. These systems have already provided disaster resiliency benefits for residential and non-residential customers.

We have seen how quickly market barriers can be overcome in response to strong policy signals, as occurred in the solar panel and electric vehicle battery space. Government-stated priorities have a significant role in guiding private and public research, development, and deployment. This Scoping Plan unequivocally puts the marker down on the need for innovation to continue in non-combustion technologies, clean energy, CO_2 removal options, and alternatives for SLCPs. The five-year update to the Scoping Plan allows for a periodic evaluation of new tools to add to the state's toolkit.

Engagement with Partners to Develop, Coordinate, and Export Policies

California works closely with other states, tribal governments, the federal government, and international jurisdictions to identify the most effective strategies and methods to reduce GHGs, manage GHG control programs, and facilitate the development of integrated and cost-effective regional, national, and international GHG reduction programs. For example, the state's Cap-and-Trade Program has been linked with Québec's since 2014, and CARB staff regularly engage with jurisdictions throughout the world on the design features of our Cap-and-Trade Program through memoranda of understanding (MOUs) and venues such as the International Climate Action

Partnership.[84] Low carbon fuel mandates similar to California's LCFS have been adopted by the U.S. EPA and by other jurisdictions, including Oregon, Washington, British Columbia, the European Union, and the United Kingdom. Many other jurisdictions from Japan to New Zealand, Australia, and the European Commission also continue to seek information and technical experience on our LCFS. California has and will continue to share information and encourage ambitious emissions reductions with interested jurisdictions, with a focus on China, India, Mexico, Canada, and the European Union. California's early action to reduce super-pollutants such as methane and other SLCPs was reaffirmed by the 2021 Global Methane Pledge signed by the U.S. and over 100 other countries at the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).[85]

In addition, under the Clean Air Act, the federal government is authorized to allow California to set more stringent vehicle emissions regulations than federal standards. California's goals and regulations to transition to 100 percent sales of new zero-emission passenger vehicles by 2035 (including plug-in hybrid vehicles), to drayage trucks by 2035, and other trucks and buses where feasible by 2045 are being emulated by partner states across the U.S. and in jurisdictions around the world. CARB's Advanced Clean Cars II regulation, [86] which codifies these targets, was approved in August 2022, and already at least four other states have announced their plans to adopt this regulation. Earlier in June 2020 CARB adopted the Advanced Clean Truck regulation, which requires truck manufacturers to meet increasing sale targets of zero-emission trucks in California through 2035. Since adoption, at least five other states—20 percent of the U.S. truck market—have adopted this regulation. These kinds of coordinated policies help signal to vehicle manufacturers a widespread and growing demand for zero-emissions technology, which in turn helps scale production and lower costs for consumers.

With the Mexican Secretariat for Environment and Natural Resources (SEMARNAT), California has engaged in a technical exchange on clean vehicle policies and helped to establish Mexico's Emissions Trading System (being piloted in 2022). A 2019 MOU signed between California and Environment and Climate Change Canada enables in-depth collaboration on policies and programs to decarbonize vehicles, engines, and fuels. This partnership has led to tangible emissions reductions, from aligning vehicle emissions targets and policies to collaborating on emissions testing and research critical to enforcing

[84] International Carbon Action Partnership (ICAP). Homepage. *https://icapcarbonaction.com/en?msclkid=dac30cb7b4f511ec94ccd0f1ae323e98*.
[85] Global Methane Pledge. Homepage. *https://www.globalmethanepledge.org/*.
[86] Cal. Code Regs., tit. 13, §§ 1900,1961.2, 1961.3, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, and 2903; and Test Procedures located here: *https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii*.

emissions limits for vehicle manufactures. At the national level, China has looked to California for cutting-edge requirements for car diagnostics and policies that promote zero-emissions vehicles. At a local level, Beijing has adopted California's vehicle emissions standards and several other progressive environmental regulations. California will continue and renew such efforts across China, including through a 2022 MOU signed with China's Ministry of Ecology and Environment.

Between 2021 and 2023, California also will serve as president of the Transport Decarbonisation Alliance, a global network of countries, regions, cities, and companies that come together to share experiences and technical expertise, and to increase the ambition and accelerate the deployment of targeted transportation decarbonization policies across freight, electric vehicle infrastructure, and active mobility. Throughout its presidency, California will focus its leadership on decarbonizing the cross-jurisdiction network of medium- and heavy-duty vehicles, both to ensure cleaner air in freight-adjacent communities and to stem the effects of climate change.

Over the years, California has also asserted the importance of and supported the ongoing efforts of state and local clean air and climate leadership. Through our participation in the Pacific Coast Collaborative alongside British Columbia, Washington, and Oregon,[87] the Under2 Coalition,[88] the U.S. Climate Alliance,[89] the International ZEV Alliance,[90] the Transportation Decarbonisation Alliance, and many more organizations, California has and will continue to build climate partnerships with state and local governments.

California also recognized the need to address the substantial emissions caused by the deforestation and degradation of tropical and other forests, and continues its work alongside other subnational governments as part of the Governors' Climate and Forests Task Force (GCF).[91] Founded in 2008, there are currently 39 GCF members, including states and provinces in Brazil, Colombia, Ecuador, Indonesia, Ivory Coast, Mexico, Nigeria, Peru, Spain, and the United States—all of whom are considering or operating programs to reduce emissions from deforestation, land-use, and rural development, and to benefit local and indigenous communities. CARB's California Tropical Forest Standard provides a rigorous methodology to assess jurisdiction-scale programs that reduce deforestation and to incentivize responsible action and investment.[92] The standard

[87] Pacific Coast Collaborative. Homepage. *https://pacificcoastcollaborative.org/*.
[88] Under2 Coalition. Homepage. *https://www.theclimategroup.org/under2-coalition*.
[89] United States Climate Alliance (USCA). Homepage. *https://www.usclimatealliance.org/*.
[90] ZEV Alliance. Homepage. Accelerating the Adoption of Zero-Emission Vehicles. *https://zevalliance.org/*.
[91] Governors' Climate and Forests Task Force. University of Colorado Boulder: Colorado Law. *https://www.gcftf.org/*.
[92] CARB. California Tropical Forest Standard. *https://ww2.arb.ca.gov/our-work/programs/california-tropical-forest-standard*.

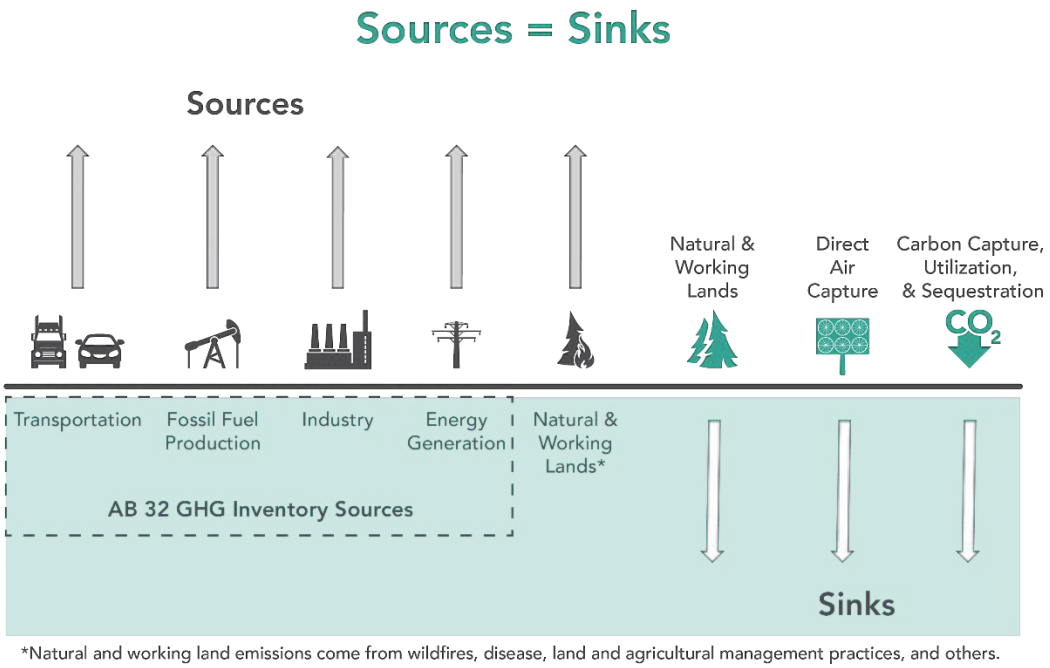
provides a strong signal to value the preservation of tropical forests over continued destructive activities such as oil exploration and extraction and ensures rigorous social and environmental safeguards for indigenous peoples and local communities.

Working Toward Carbon Neutrality

To date, California and many other regions have focused on reducing GHG emissions from the industrial, energy, and transportation sectors. As defined in statute, the state's 2020 and 2030 targets include all in-state sources of GHG emissions—and those emissions associated with imported power that is consumed in the state. By moving to a framework of carbon neutrality, the scope for accounting is expanded to include all sources and sinks. As such, carbon neutrality is achieved when the GHG fluxes are at equilibrium—when sources equal sinks. Figure 1-5 depicts the sources included in the AB 32 GHG Inventory and the new sources and sinks added in this Scoping Plan under the framework of carbon neutrality. Natural and working lands are able to sequester carbon and therefore play an increasingly important role in this framework. However, modeling for this plan shows that carbon sequestration in our natural and working lands alone will be insufficient to achieve carbon neutrality no later than 2045. Therefore, this plan also considers the role of carbon capture and sequestration, as well as biological and mechanical carbon sequestration processes that are included in the IPCC Sixth Assessment Report,[93] as necessary tools for climate change mitigation.

[93] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.

Figure 1-5: Carbon neutrality: Balancing the net flux of GHG emissions from all sources and sinks



*Natural and working land emissions come from wildfires, disease, land and agricultural management practices, and others.

Supporting Healthy and Resilient Lands

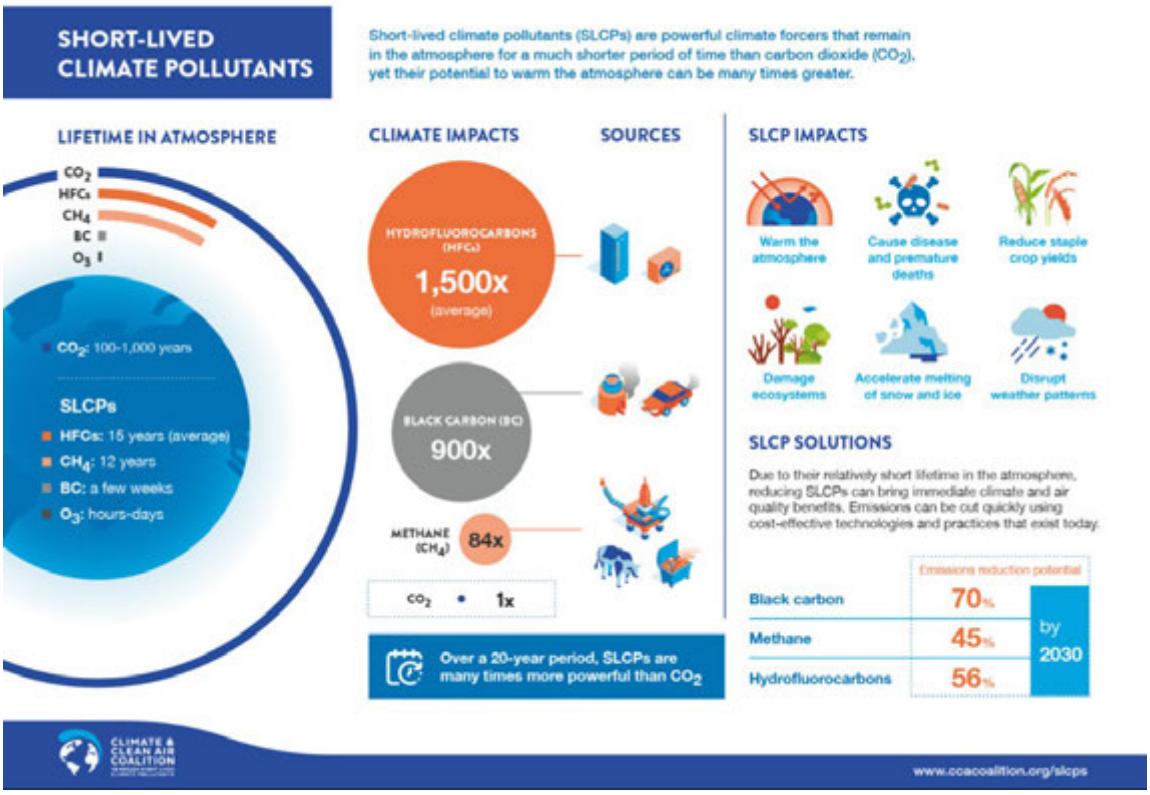
Our natural and working lands are an important piece in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric carbon dioxide in forests, grasslands, soils, and wetlands. Healthy lands can also reduce emissions of powerful short-lived climate pollutants, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts. Through climate smart land management that focuses on supporting healthy living systems, we can support our carbon neutrality goals, reduce emissions, advance sequestration, and support healthy and more climate-resilient lands.

Maintaining the Focus on Methane and Short-Lived Climate Pollutants

Given the urgency of climate change, the often-disproportional impacts already being felt by underserved populations across California and the world, and the need to rapidly decarbonize and avoid climate tipping points as identified in the most recent IPCC assessment, efforts to reduce short-lived climate pollutants are especially important. SLCPs include methane (CH_4), black carbon (soot), and fluorinated gases (F-gases,

including hydrofluorocarbons, or HFCs), and they are among the most harmful pollutants to both human health and the global climate. SLCPs are more potent than CO_2 in terms of their impact on climate change (and subsequently, global warming) and have a much shorter lifetime in the atmosphere than CO_2 does. That means they have an outsized impact on climate change in the near term—they are responsible for up to 45 percent of current climate forcing. It also means that targeted efforts to reduce short-lived climate pollutant emissions can provide outsized climate and health benefits, within weeks to about a decade (see Figure 1-6).

Figure 1-6: Short-lived climate pollutant impacts[94]



California has been a leader in addressing SLCP emissions. As part of the 2014 Scoping Plan,[95] CARB committed to developing a dedicated strategy to reduce SLCP emissions.

[94] Climate and Clean Air Coalition. Short-Lived Climate Pollutants (SLCPs). https://www.ccacoalition.org/en/content/short-lived-climate-pollutants-slcps.
[95] CARB. 2014. *First Update.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.

The resulting SLCP Reduction Strategy,[96] adopted by CARB in 2017, implements targets codified in SB 1383 (Lara, Chapter 395, Statutes of 2016) to reduce methane and HFC emissions by 40 percent by 2030 and anthropogenic black carbon emissions by 50 percent. California worked with several other states through the U.S. Climate Alliance to establish a similar goal to reduce SLCP emissions in line with the requirements of the Paris Agreement,[97] identifying the potential to reduce SCLPs by 40 to 50 percent by 2030 across the U.S. Climate Alliance.[98]

Process for Developing the Scoping Plan

This Scoping Plan was developed in coordination with the Governor's Office and state agencies, in accordance with direction from the Chair and Members of CARB, through engagement with the Legislature, with advice from the EJ Advisory Committee, in consultation with tribes, and with open and transparent opportunities for stakeholders and the public to engage in workshops and other meetings. Appendix A (Public Process) includes details of the public workshops, and Chapter 5 includes details of the EJ Advisory Committee's role in the Scoping Plan update process.

Guidance from the Administration and Legislature

This Scoping Plan reflects existing and recent direction in the Governor's Executive Orders and Statutes. Table 1-1 provides a summary of major climate legislation and executive orders issued since the adoption of the 2017 Scoping Plan.

[96] CARB. 2017. *Short-Lived Climate Pollutant Reduction Strategy.* https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[97] UNFCCC. 2015. Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
[98] USCA. 2018. *From SLCP Challenge to Action: A Roadmap for Reducing Short-Lived Climate Pollutants to Meet the Goals of the Paris Agreement.* http://www.usclimatealliance.org/slcp-challenge-to-action.

Table 1-1: Major climate legislation and executive orders enacted since the 2017 Scoping Plan

Bill/Executive Order	Summary
Assembly Bill 1279 (AB 1279) (Muratsuchi, Chapter 337, Statutes of 2022) *The California Climate Crisis Act*	AB 1279 establishes the policy of the state to achieve carbon neutrality as soon as possible, but no later than 2045; to maintain net negative GHG emissions thereafter; and to ensure that by 2045 statewide anthropogenic GHG emissions are reduced at least 85 percent below 1990 levels. The bill requires CARB to ensure that Scoping Plan updates identify and recommend measures to achieve carbon neutrality, and to identify and implement policies and strategies that enable CO_2 removal solutions and carbon capture, utilization, and storage (CCUS) technologies. This bill is reflected directly in this Scoping Plan.
Senate Bill 905 (SB 905) (Caballero, Chapter 359, Statutes of 2022) *Carbon Capture, Removal, Utilization, and Storage Program*	SB 905 requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program to evaluate, demonstrate, and regulate CCUS and carbon dioxide removal (CDR) projects and technology. The bill requires CARB, on or before January 1, 2025, to adopt regulations creating a unified state permitting application for approval of CCUS and CDR projects. The bill also requires the Secretary of the Natural Resources Agency to publish a framework for governing agreements for two or more tracts of land overlying the same geologic storage reservoir for the purposes of a carbon sequestration project. The Scoping Plan modeling reflects both CCUS and CDR contributions to achieve carbon neutrality.
Senate Bill 846 (SB 846) (Dodd, Chapter 239, Statutes of 2022) *Diablo Canyon Powerplant: Extension of Operations*	SB 846 extends the Diablo Canyon Power Plant's sunset date by up to five additional years for each of its two units and seeks to make the nuclear power plant eligible for federal loans. The bill requires that the California Public Utilities Commission (CPUC) not include and disallow a load-serving entity from including in their adopted resource plan, the energy, capacity, or any attribute from the Diablo Canyon power plant. The Scoping Plan explains the emissions impact of this legislation.
Senate Bill 1020 (SB 1020) (Laird,	SB 1020 adds interim renewable energy and zero carbon energy retail sales of electricity targets to California end-use customers set at 90 percent in 2035 and 95 percent in 2040.

Chapter 361, Statutes of 2022) *Clean Energy, Jobs, and Affordability Act of 2022*	It accelerates the timeline required to have 100 percent renewable energy and zero carbon energy procured to serve state agencies from the original target year of 2045 to 2035. This bill requires each state agency to individually achieve the 100 percent goal by 2035 with specified requirements. This bill requires the CPUC, California Energy Commission (CEC), and CARB, on or before December 1, 2023, and annually thereafter, to issue a joint reliability progress report that reviews system and local reliability. The bill also modifies the requirement for CARB to hold a portion of its Scoping Plan workshops in regions of the state with the most significant exposure to air pollutants by further specifying that this includes communities with minority populations or low-income communities in areas designated as being in extreme federal non-attainment. The Scoping Plan describes the implications of this legislation on emissions.
Senate Bill 1137 (SB 1137) (Gonzales, Chapter 365, Statutes of 2022) *Oil & Gas Operations: Location Restrictions: Notice of Intention: Health protection zone: Sensitive receptors*	SB 1137 prohibits the development of new oil and gas wells or infrastructure in health protection zones, as defined, except for purposes of public health and safety or other limited exceptions. The bill requires operators of existing oil and gas wells or infrastructure within health protection zones to undertake specified monitoring, public notice, and nuisance requirements. The bill requires CARB to consult and concur with the California Geologic Energy Management Division (CalGEM) on leak detection and repair plans for these facilities, adopt regulations as necessary to implement emission detection system standards, and collaborate with CalGEM on public access to emissions detection data.
Senate Bill 1075 (SB 1075) (Skinner, Chapter 363, Statutes of 2022) *Hydrogen: Green Hydrogen: Emissions of Greenhouse Gases*	SB 1075 requires CARB, by June 1, 2024, to prepare an evaluation that includes: policy recommendations regarding the use of hydrogen, and specifically the use of green hydrogen, in California; a description of strategies supporting hydrogen infrastructure, including identifying policies that promote the reduction of GHGs and short-lived climate pollutants; a description of other forms of hydrogen to achieve emission reductions; an analysis of curtailed electricity; an estimate of GHG and emission reductions that could be achieved through deployment of green hydrogen through a variety of scenarios; an analysis of the potential for opportunities to integrate hydrogen production and applications with drinking water supply treatment needs; policy recommendations for regulatory and permitting processes

	associated with transmitting and distributing hydrogen from production sites to end uses; an analysis of the life-cycle GHG emissions from various forms of hydrogen production; and an analysis of air pollution and other environmental impacts from hydrogen distribution and end uses. This bill would inform the production of hydrogen at the scale called for in this Scoping Plan.
Assembly Bill 1757 (AB 1757) (Garcia, Chapter 341, Statutes of 2022) *California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands*	AB 1757 requires the California Natural Resources Agency (CNRA), in collaboration with CARB, other state agencies, and an expert advisory committee, to determine a range of targets for natural carbon sequestration, and for nature-based climate solutions, that reduce GHG emissions in 2030, 2038, and 2045 by January 1, 2024. These targets must support state goals to achieve carbon neutrality and foster climate adaptation and resilience. This bill also requires CARB to develop standard methods for state agencies to consistently track GHG emissions and reductions, carbon sequestration, and additional benefits from natural and working lands over time. These methods will account for GHG emissions reductions of CO_2, methane, and nitrous oxide related to natural and working lands and the potential impacts of climate change on the ability to reduce GHG emissions and sequester carbon from natural and working lands, where feasible. This Scoping Plan describes the next steps and implications of this legislation for the natural and working lands sector.
Senate Bill 1206 (SB 1206) (Skinner, Chapter 884, Statutes of 2022) *Hydrofluorocarbon gases: sale or distribution*	SB 1206 mandates a stepped sales prohibition on newly produced high- global warming potential (GWP) HFCs to transition California's economy toward recycled and reclaimed HFCs for servicing existing HFC-based equipment. Additionally, SB 1206 also requires CARB to develop regulations to increase the adoption of very low-, i.e., GWP < 10, and no-GWP technologies in sectors that currently rely on higher-GWP HFCs.
Senate Bill 27 (SB 27) (Skinner, Chapter 237, Statutes of 2021)	SB 27 requires CNRA, in coordination with other state agencies, to establish the Natural and Working Lands Climate Smart Strategy by July 1, 2023. This bill also requires CARB to establish specified CO_2 removal targets for 2030 and beyond as part of its Scoping Plan. Under SB 27, CNRA is to establish and maintain a registry to identify projects in the state

Carbon Sequestration: State Goals: Natural and Working Lands: Registry of Projects	that drive climate action on natural and working lands and are seeking funding. CNRA also must track carbon removal and GHG emission reduction benefits derived from projects funded through the registry. This bill is reflected directly in this Scoping Plan as CO_2 removal targets for 2030 and 2045 in support of carbon neutrality.
Senate Bill 596 (SB 596) (Becker, Chapter 246, Statutes of 2021) *Greenhouse Gases: Cement Sector: Net-zero Emissions Strategy*	SB 596 requires CARB, by July 1, 2023, to develop a comprehensive strategy for the state's cement sector to achieve net-zero-emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. The bill establishes an interim target of 40 percent below the 2019 average GHG intensity of cement by December 31, 2035. Under SB 596, CARB must: • Define a metric for GHG intensity and establish a baseline from which to measure GHG intensity reductions. • Evaluate the feasibility of the 2035 interim target (40 percent reduction in GHG intensity) by July 1, 2028. • Coordinate and consult with other state agencies. • Prioritize actions that leverage state and federal incentives. • Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low GHG intensity. The Scoping Plan modeling is designed to achieve these outcomes.
Executive Order N-82-20	Governor Newsom signed Executive Order N-82-20 in October 2020 to combat the climate and biodiversity crises by setting a statewide goal to conserve at least 30 percent of California's land and coastal waters by 2030. The Executive Order also instructed the CNRA, in consultation with other state agencies, to develop a Natural and Working Lands Climate Smart Strategy that serves as a framework to advance the state's carbon neutrality goal and build climate resilience. In addition to setting a statewide conservation goal, the Executive Order directed CARB to update the target for natural and working lands in support of carbon neutrality as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy.

	Executive Order N-82-20 also calls on the CNRA, in consultation with other state agencies, to establish the California Biodiversity Collaborative (Collaborative). The Collaborative shall be made up of governmental partners, California Native American tribes, experts, business and community leaders, and other stakeholders from across the state. State agencies will consult the Collaborative on efforts to: • Establish a baseline assessment of California's biodiversity that builds upon existing data and can be updated over time. • Analyze and project the impact of climate change and other stressors in California's biodiversity. • Inventory current biodiversity efforts across all sectors and highlight opportunities for additional action to preserve and enhance biodiversity. CNRA also is tasked with advancing efforts to conserve biodiversity through various actions, such as streamlining the state's process to approve and facilitate projects related to environmental restoration and land management. The California Department of Food and Agriculture (CDFA) is directed to advance efforts to conserve biodiversity through measures such as reinvigorating populations of pollinator insects, which restore biodiversity and improve agricultural production. The Natural and Working Lands Climate Smart Strategy informs this Scoping Plan.
Executive Order N-79-20	Governor Newsom signed Executive Order N-79-20 in September 2020 to establish targets for the transportation sector to support the state in its goal to achieve carbon neutrality by 2045. The targets established in this Executive Order are: • 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. • 100 percent of medium- and heavy-duty vehicles will be zero-emission by 2045 for all operations where feasible, and by 2035 for drayage trucks. • 100 percent of off-road vehicles and equipment will be zero-emission by 2035 where feasible. The Executive Order also tasked CARB to develop and propose regulations that require increasing volumes of zero-electric passenger vehicles, medium- and heavy-duty

	vehicles, drayage trucks, and off-road vehicles toward their corresponding targets of 100 percent zero-emission by 2035 or 2045, as listed above. The Scoping Plan modeling reflects achieving these targets.
Executive Order N-19-19	Governor Newsom signed Executive Order N-19-19 in September 2019 to direct state government to redouble its efforts to reduce GHG emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy. This Executive Order instructs the Department of Finance to create a Climate Investment Framework that: • Includes a proactive strategy for the state's pension funds that reflects the increased risks to the economy and physical environment due to climate change. • Provides a timeline and criteria to shift investments to companies and industry sectors with greater growth potential based on their focus of reducing carbon emissions and adapting to the impacts of climate change. • Aligns with the fiduciary responsibilities of the California Public Employees' Retirement System, California State Teachers' Retirement System, and the University of California Retirement Program. Executive Order N-19-19 directs the State Transportation Agency to leverage more than $5 billion in annual state transportation spending to help reverse the trend of increased fuel consumption and reduce GHG emissions associated with the transportation sector. It also calls on the Department of General Services to leverage its management and ownership of the state's 19 million square feet in managed buildings, 51,000 vehicles, and other physical assets and goods to minimize state government's carbon footprint. Finally, it tasks CARB with accelerating progress toward California's goal of five million ZEV sales by 2030 by: • Developing new criteria for clean vehicle incentive programs to encourage manufacturers to produce clean, affordable cars. • Proposing new strategies to increase demand in the primary and secondary markets for ZEVs. • Considering strengthening existing regulations or adopting new ones to achieve the necessary GHG reductions from within the transportation sector.

	The Scoping Plan modeling reflects efforts to accelerate ZEV deployment.
Senate Bill 576 (SB 576) (Umberg, Chapter 374, Statutes of 2019) *Coastal Resources: Climate Ready Program and Coastal Climate Change Adaptation, Infrastructure and Readiness Program*	Sea level rise, combined with storm-driven waves, poses a direct risk to the state's coastal resources, including public and private real property and infrastructure. Rising marine waters threaten sensitive coastal areas, habitats, the survival of threatened and endangered species, beaches, other recreation areas, and urban waterfronts. SB 576 mandates that the Ocean Protection Council develop and implement a coastal climate adaptation, infrastructure, and readiness program to improve the climate change resiliency of California's coastal communities, infrastructure, and habitat. This bill also instructs the State Coastal Conservancy to administer the Climate Ready Program, which addresses the impacts and potential impacts of climate change on resources within the conservancy's jurisdiction.
Assembly Bill 65 (AB 65) (Petrie-Norris, Chapter 347, Statutes of 2019) *Coastal Protection: Climate Adaption: Project Prioritization: Natural Infrastructure: Local General Plans*	This bill requires the State Coastal Conservancy, when it allocates any funding appropriated pursuant to the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018, to prioritize projects that use natural infrastructure in coastal communities to help adapt to climate change. The bill requires the conservancy to provide information to the Office of Planning and Research on any projects funded pursuant to the above provision to be considered for inclusion into the clearinghouse for climate adaption information. The bill authorizes the conservancy to provide technical assistance to coastal communities to better assist them with their projects that use natural infrastructure.
Executive Order B-55-18	Governor Brown signed Executive Order B-55-18 in September 2018 to establish a statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter. Policies and programs undertaken to achieve this goal shall: • Seek to improve air quality and support the health and economic resiliency of urban and rural communities, particularly low-income and disadvantaged communities. • Be implemented in a manner that supports climate adaptation and biodiversity, including protection of the state's water supply, water quality, and native plants and animals.

	This Executive Order also calls for CARB to: • Develop a framework for implementation and accounting that tracks progress toward this goal. • Ensure future Scoping Plans identify and recommend measures to achieve the carbon neutrality goal. This Scoping Plan is designed to achieve carbon neutrality no later than 2045 and the modeling includes technology and fuel transitions to achieve that outcome.
Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018) *California Renewables Portfolio Standard Program: emissions of greenhouse gases*	SB 100 mandates that the CPUC, CEC, and CARB plan for 100 percent of total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by December 31, 2045. This bill also updates the state's Renewables Portfolio Standard (RPS) to include the following interim targets: • 44% of retail sales procured from eligible renewable sources by December 31, 2024. • 52% of retail sales procured from eligible renewable sources by December 31, 2027. • 60% of retail sales procured from eligible renewable sources by December 31, 2030. Under SB 100, the CPUC, CEC, and CARB shall use programs under existing laws to achieve 100 percent clean electricity. The statute requires these agencies to issue a joint policy report on SB 100 every four years. The first of these reports was issued in 2021. This Scoping Plan reflects the SB 100 Core Scenario resource mix with a few minor updates.
Assembly Bill 2127 (AB 2127) (Ting, Chapter 365, Statutes of 2018) *Electric Vehicle Charging Infrastructure: Assessment*	This bill requires the CEC, working with CARB and the CPUC, to prepare and biennially update a statewide assessment of the electric vehicle charging infrastructure needed to support the levels of electric vehicle adoption required for the state to meet its goals of putting at least 5 million zero-emission vehicles on California roads by 2030 and of reducing emissions of GHGs to 40% below 1990 levels by 2030. The bill requires the CEC to regularly seek data and input from stakeholders relating to electric vehicle charging infrastructure. This bill supports the deployment of ZEVs as modeled in this Scoping Plan.

Senate Bill 30 (SB 30) (Lara, Chapter 614, Statutes of 2018) *Insurance: Climate Change*	This bill requires the Insurance Commissioner to convene a working group to identify, assess, and recommend risk transfer market mechanisms that, among other things, promote investment in natural infrastructure to reduce the risks of climate change related to catastrophic events, create incentives for investment in natural infrastructure to reduce risks to communities, and provide mitigation incentives for private investment in natural lands to lessen exposure and reduce climate risks to public safety, property, utilities, and infrastructure. The bill requires the policies recommended to address specified questions.
Assembly Bill 2061 (AB 2061) (Frazier, Chapter 580, Statutes of 2018) *Near-zero-emission and Zero-emission Vehicles*	Existing state and federal law sets specified limits on the total gross weight imposed on the highway by a vehicle with any group of two or more consecutive axles. Under existing federal law, the maximum gross vehicle weight of that vehicle may not exceed 82,000 pounds. AB 2061 authorizes a near-zero-emission vehicle or a zero-emission vehicle to exceed the weight limits on the power unit by up to 2,000 pounds. This bill supports the deployment of cleaner trucks as modeled in this Scoping Plan.

Consideration of Relevant State Plans and Regulations

Development of this Scoping Plan also included careful consideration of, and coordination with, other state agency plans and regulations, including the SB 100 Joint Agency Report,[99] the 2022 State Strategy for the State Implementation Plan,[100] Climate Action Plan for Transportation Infrastructure,[101] AB 74 Studies on Vehicle Emissions and Fuel Demand and Supply,[102,103,104] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[105]

[99] CPUC, CEC, and CARB. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100.
[100] CARB. January 31, 2022. Draft 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_State_SIP_Strategy.pdf.
[101] CalSTA. 2021. *Climate Action Plan.* https://calsta.ca.gov/subject-areas/climate-action-plan.
[102] CalEPA. 2021. Carbon Neutrality Studies. https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[103] Brown, A. L., et. al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0.
[104] Deschenes, O. 2021. *Enhancing equity*. https://zenodo.org/record/4707966#.YKPiaKhKi73.
[105] CARB. Short-Lived Climate Pollutants. https://ww2.arb.ca.gov/our-work/programs/slcp.

CARB's Achieving Carbon Neutrality Report,[106] Climate Smart Strategy,[107] and draft Natural and Working Lands Implementation Plan,[108] among others.

Input from Partners and Stakeholders

CARB also collaborated with other state agencies, held consultations with tribes, and solicited comments and feedback from affected stakeholders, including labor organizations and the public. The process to update the Scoping Plan began with kickoff workshops in early June 2021,[109] followed by over a dozen public workshops, including engagement with tribes,[110] and featured a series of EJ Advisory Committee and environmental justice community meetings.[111] The June 2021 workshop and several others were a joint agency effort, as there are many agencies with direct authority or jurisdiction over different sectors of the economy. Consultation with agencies also included bi-weekly, monthly, and weekly meetings.

During the summer of 2022 CARB held three community listening sessions, hosted by the CARB Chair and Board, in communities around the state, along with one virtual community listening session and one tribal listening session specifically for tribes. Many tribes provided written feedback, which was incorporated into this Scoping Plan. In addition, CARB respects tribal sovereignty and also engaged in a consultation campaign with tribes, which resulted in government-to-government consultations, and this Scoping Plan is reflective of this process.[112]

Emissions Data That Inform the Scoping Plan

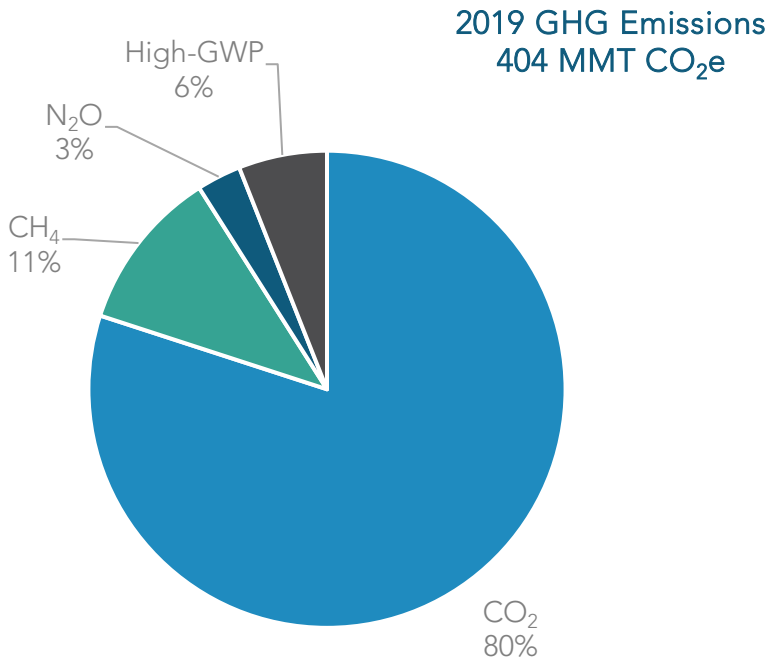
Greenhouse Gas Emissions

AB 32 includes which GHGs are to be regulated, reduced, and included in the state's targets and goals. That list includes seven GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs),

[106] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.
[107] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions.
[108] CARB. 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan.* https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft.
[109] Appendix A (Public Process).
[110] CARB. Scoping Plan Meetings & Workshops. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops.
[111] CARB. Environmental Justice Advisory Committee Meetings and Events. https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events.
[112] CARB. 2018. Tribal Consultation Policy. October. https://www.arb.ca.gov/regact/nonreg/2018/california_air_resources_board_tribal_consultation_policy.pdf.

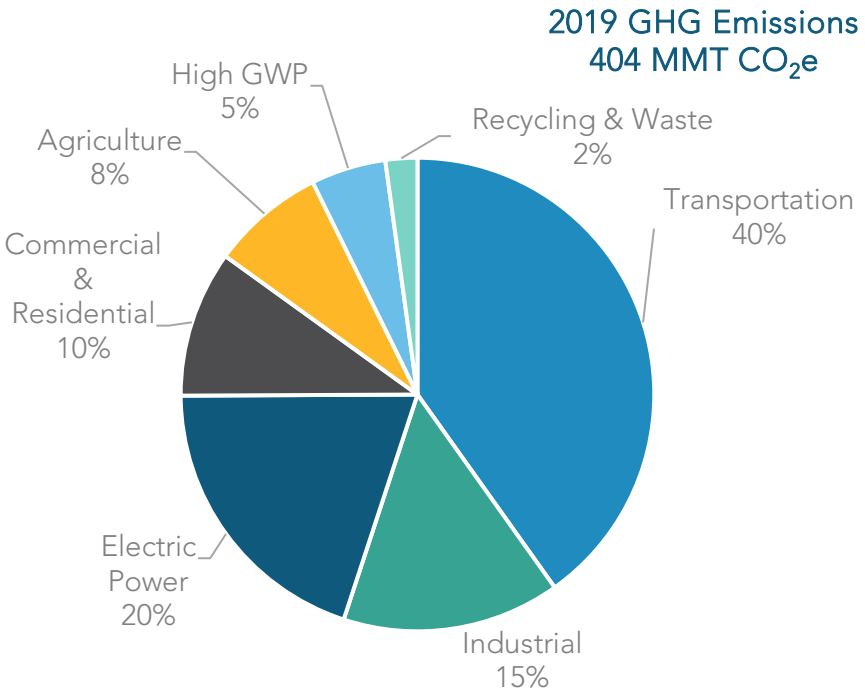
perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). Carbon dioxide is the primary GHG emitted in California, accounting for 83 percent of the total GHG emissions in 2019, as shown in Figure 1-7 below. Figure 1-8 illustrates that transportation (primarily on-road travel) is the single largest source of CO_2 emissions in the state. Upstream transportation emissions from the refinery and oil and gas sectors are categorized as CO_2 emissions from industrial sources and constitute about 50 percent of the industrial source emissions. When including these emissions, the transportation sector accounts for approximately half of statewide GHG emissions. Other significant sources of CO_2 include electricity production, industrial sources like refineries and cement plants, and residential sources like fossil gas. Figures 1-7 and 1-8 show state GHG emission contributions by GHG and sector based on the 2020 Greenhouse Gas Emission Inventory; GHG emissions for 2019 are shown because 2020 was an outlier due to the global pandemic. Emissions in Figure 1-8 are depicted by Scoping Plan sector, which includes separate categories for high-global warming potential (GWP) and recycling/waste emissions that are otherwise typically included within other economic sectors.

Figure 1-7: 2019 State GHG emission contributions by GHG[113]



[113] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

Figure 1-8: 2019 State GHG emission contributions by Scoping Plan sector[114]



The scope of the AB 32 GHG Inventory encompasses emission sources within the state's borders, as well as imported electricity consumed in the state. This construct for the inventory is consistent with IPCC practices to allow for comparison of statewide GHG emissions with those at the national level and with other international GHG inventories. Statewide GHG emissions calculations use many data sources, including data from other state and federal agencies. However, a significant source of data comes from reports submitted to CARB through the Regulation for the Mandatory Reporting of GHG Emissions (MRR). The MRR requires facilities and entities with more than 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) of combustion and process emissions, all facilities belonging to certain industries, and all electric power entities to submit an annual GHG emissions data report directly to CARB. Furthermore, this regulation requires that reports from entities that emit more than 25,000 $MTCO_2e$ be verified by a CARB-

[114] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily HFCs, are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

accredited third-party verification body. More information on MRR emissions reports can be found at CARB's Mandatory Greenhouse Gas Emissions Reporting website.[115]

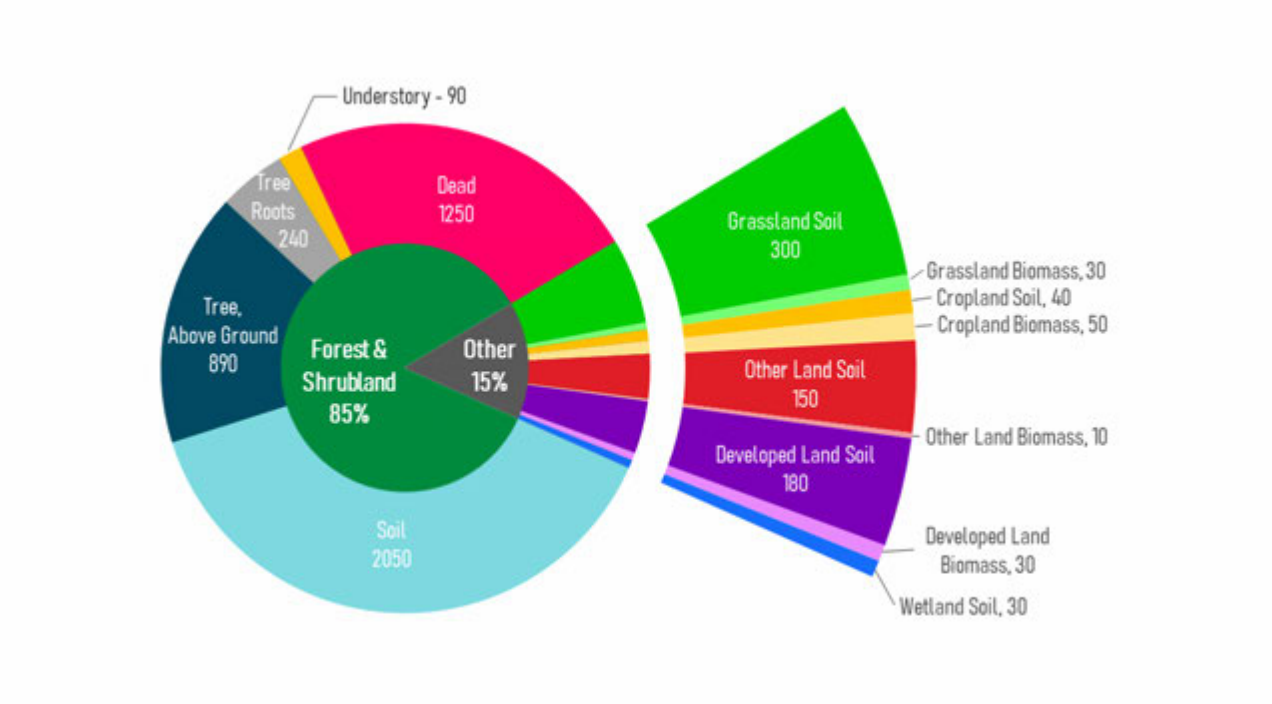
All data sources used to develop the GHG Emission Inventory are listed in CARB's inventory supporting documentation.[116]

Natural and Working Lands

For natural and working lands, the 2018 ecosystem carbon inventory (NWL Inventory)[117] shows there are approximately 5,340 million metric tons (MMT) of carbon in the carbon pools[118] (reservoirs of carbon that have the ability to both take in and release carbon) that CARB has quantified (see Figure 1-9). For purposes of comparison, 5,340 MMT of ecosystem carbon stock is equivalent to 19,600 MMT of atmospheric CO_2. Forests and shrublands contain the majority of California's carbon stock because they cover the majority of California's landscape and have the highest carbon density of any land cover type. All other land categories combined comprise over 35 percent of California's total acreage, but only 15 percent of carbon stocks. Roughly half of the 5,340 MMT of carbon resides in soils and half in plant biomass.

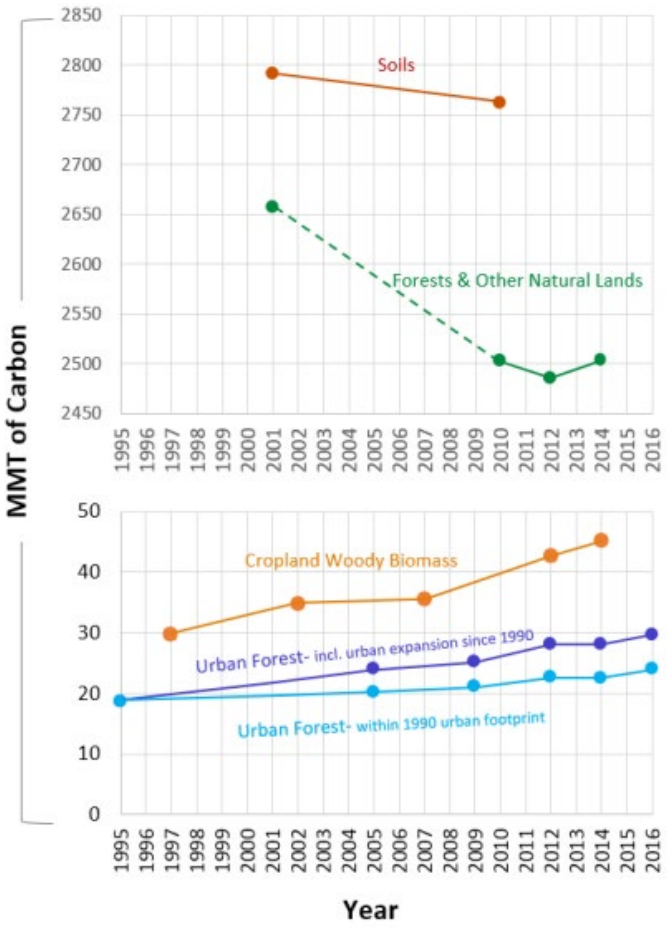
[115] CARB. Mandatory Greenhouse Gas Emissions Reporting. *https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting*.
[116] CARB. Current California GHG Emission Inventory Data. *www.arb.ca.gov/cc/inventory/data/data.htm*.
[117] CARB. 2018. *An Inventory of Ecosystem Carbon in California's Natural and Working Lands. https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory.pdf*.
[118] "Carbon pools" are Above-Ground Live Biomass (boles, stems, and foliage in shrubs, trees, grasses, and herbaceous vegetation), Below-Ground Live Biomass (roots in shrubs, trees, grasses, and herbaceous vegetation), Dead Organic Matter (standing or downed dead wood and litter), Harvested Wood Products (all wood and bark material that leaves harvest sites regardless of whether it is eventually incorporated into merchandisable products), and Soil Organic Matter (organic carbon in the top 30 centimeters of soil).

Figure 1-9: Carbon stocks in natural and working lands (MMT carbon)



In addition to providing an estimate of the ecosystem carbon that exists on California's landscape, the NWL Inventory also shows how those carbon stocks are changing (see Figure 1-10). The inventory attributes stock change to human activity, such as land use change, or to disturbances, such as wildfire. CARB's inventory shows these lands were a source of GHG emissions from 2001 to 2011, releasing more carbon than they stored, and then they returned to be a slight carbon sink from 2012 to 2014. These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon.

Figure 1-10: Changes in carbon stock by landscape type



For natural and working lands, California's inventory is also based on IPCC methods for tracking ecosystem carbon over time, providing for comparability with other national and subnational inventories and carbon accounting. As such, the NWL Inventory is an important tool for tracking both carbon stock changes in California over time and the impacts that interventions such as those identified in this Scoping Plan, actions identified in the Climate Smart Land Strategy, and others have on NWL carbon stocks.

All data sources used to develop the NWL Inventory are listed in the technical support documentation at CARB's California Natural & Working Lands Inventory website.[119]

[119] CARB. California Natural & Working Lands Inventory. *https://ww2.arb.ca.gov/nwl-inventory*.

Black Carbon

In addition, CARB has developed a statewide emission inventory for black carbon in support of the SLCP Strategy. The inventory is reported in two categories: non-forestry (anthropogenic) sources and forestry sources.[120] The black carbon inventory is calculated using existing $PM_{2.5}$ emission inventories combined with speciation profiles that define the fraction of $PM_{2.5}$ that is black carbon. The black carbon inventory helps support implementation of the SLCP Strategy, but it is not part of California's GHG Inventory that tracks progress toward the state's climate targets under AB 32 or SB 32. The state's major anthropogenic sources of black carbon include off-road transportation, on-road transportation, residential wood burning, fuel combustion, and industrial processes. CARB estimated 2017 black carbon emissions to be approximately 8 $MTCO_2e$.[121] The majority of anthropogenic sources come from transportation—specifically, heavy-duty vehicles. The share of black carbon emissions from transportation is dropping rapidly and is expected to continue to do so between now and 2030 as a result of California's air quality programs. The remaining black carbon emissions will come largely from woodstoves/fireplaces, off-road applications, and industrial/commercial combustion. The forestry category includes non-agricultural prescribed burning and wildfire emissions.

Tracking Life-Cycle and Out-of-State Emissions

In recent years there has been increased interest in the embedded carbon in products, also known as *life-cycle emissions.* A life-cycle accounting framework refers to all of the GHG emissions generated from the sourcing, production, and transportation of products to an endpoint. In doing such assessments for a product, emissions may be associated with sourced materials and production activity outside a jurisdiction's borders. While life-cycle emissions can provide a more comprehensive picture of the emissions associated with the goods we consume and ongoing demand, life-cycle inventories are inconsistent with IPCC standards, as they would result in double counting of emissions across jurisdictions. Other countries and regions do produce their own inventory reports consistent with IPCC methods and are taking action to reduce emissions within their jurisdictions. In addition, jurisdictions often lack legal authority to regulate sources outside of their borders. Finally, it is difficult to obtain accurate data for sources and production activities outside of a region's border that would impact the accuracy of such an inventory. For these reasons, the inventory used in the Scoping Plan does not use a life-cycle

[120] SB 1383. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383*.
[121] This is a preliminary estimate developed for this Scoping Plan. Official Black Carbon emissions estimates are provided in the SLCP inventory here: *https://ww2.arb.ca.gov/ghg-slcp-inventory*.

approach and remains consistent with international accounting standards and consistent with how other countries and regions track emissions within their jurisdictions.

However, GHG mitigation action may cross geographic borders as part of subnational and international collaboration, or as a natural result of implementation of regional policies. In addition to the state's existing GHG inventory, CARB will develop an accounting framework that reflects the benefits of our policies accruing outside of the state. This accounting framework will be important to better understand the true impact of the state's policies on what is emitted into the atmosphere. For example, the LCFS incentivizes GHG reductions along the entire supply chain for the production and delivery of transportation fuel imported for use in the state. However, our inventory only captures the change in emissions from the tailpipe of when that fuel is used in California and does not capture any GHG reductions that occur in the production process if the fuel is produced out of state.

Natural and working lands forestry actions are another example, where California's policies are inspiring forest management actions in other states that result in increased permanent carbon sequestration. California's NWL inventory does not capture the increased carbon stocks resulting from forestry projects happening outside of California, and the CO_2 removals resulting from these projects are not applied in either CARB's NWL inventory or CARB's AB 32 GHG Emissions Inventory. For GHG reductions outside of the state to be attributed to our programs, those reductions must be real, quantifiable, verifiable, and permanent.

It also will be important to avoid any double counting (including claims to those reductions by other jurisdictions) and to transparently indicate whether any extra-jurisdictional emissions reductions might be included in another region's inventory. CARB is collaborating with other jurisdictions to ensure GHG accounting rules are consistent with international best practices, as robust accounting rules instill confidence in the reductions claimed and maintain support for joint action across jurisdictions. The policy goals of consistency and transparency are critical as we work together with other jurisdictions on our parallel paths to achieve our GHG targets with real benefits to the atmosphere.

Tracking Progress

Historically, the AB 32 GHG Inventory has been the primary metric to track progress toward achieving climate targets.[122] However, we must now deploy clean technology at unprecedented rates. The emissions modeling underpinning this Scoping Plan and

[122] Starting with the 2022 Edition of the AB 32 GHG inventory, the inventory development now relies more directly on the annually reported and third-party verified emissions from the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions.

targets for clean technology in statute can serve as leading indicators across the economy on how our actions compare to the pace of action needed to be on track to achieve carbon neutrality. The California Climate Dashboard[123] was launched in 2022 and provides high-level metrics for clean energy production and technology deployment. Statistics such as the deployment of zero emission vehicles and clean electricity generation are just some of the examples of metrics across the economy that can be tracked, in addition to GHG emissions, to understand if the state is on track to meet its climate goals. A key indicator to track will be building of new energy infrastructure and deployment of clean technology as evaluated in the uncertainty analysis in Chapter 2. CARB will coordinate with state agencies to establish and make public similar metrics across all economic sectors to help provide transparency on the state's progress in deploying clean technology at the pace and scale needed to achieve carbon neutrality no later than 2045.

[123] CalEPA. California Climate Dashboard. *https://calepa.ca.gov/climate-dashboard/*.

Chapter 2: The Scoping Plan Scenario

This chapter describes the Scoping Plan Scenario, which for the first time includes sources in both the AB 32 GHG Inventory and Natural and Working Lands (NWL). It begins with a short description of the alternatives evaluated. Four scenarios for the AB 32 GHG Inventory and NWL were considered separately and helped to inform the Scoping Plan Scenario. Each of the alternatives were considered in terms of the important criteria and priorities that the state's comprehensive climate action must deliver, including the need for GHG reductions that are not only technologically feasible and cost-effective, but also can deliver health and economic benefits for the state. All the scenarios were set against what is called the *Reference Scenario*—that is, what the GHG emissions would look like if we did nothing at all beyond the existing policies that are required and already in place to achieve the 2030 target of at least 40 percent below 1990 levels, or those expected with no new actions in the NWL sector. For this Scoping Plan, two sets of modeling tools were used to evaluate the AB 32 GHG Inventory and NWL sectors because no single model can assess both AB 32 sectors and NWL together. As a result, two different sets of scenarios were developed for each sector type. While this chapter breaks out discussion separately for the two sector types, the Scoping Plan Scenario reflects the combined actions across both sectors by choosing an alternative from each sector type. The modeling provides point estimates; however, that does not imply precision. As discussed in the uncertainty section, several types of uncertainties are associated with any outcomes projected by the modeling results. There will be ranges of estimates associated with each point that are not shown in the graphs or results.

Scenarios for the AB 32 GHG Inventory Sectors

The Reference Scenario for the AB 32 GHG Inventory sectors shows continuing but modest GHG reductions beyond 2030 that level off toward mid-century. The comprehensive analysis of all four alternatives indicates that the Scoping Plan Scenario is the best choice to achieve California's climate and clean air goals while balancing the legislative direction on prioritizing direct emissions reductions, reducing anthropogenic emissions by at least 85 percent by 2045, being technologically feasible, and being cost-effective. It also protects public health, provides a solid foundation for continued economic growth, and drastically reduces the state's dependence on fossil fuel combustion and does not disproportionately impact disadvantaged communities. Each of the alternative scenarios was the product of a process of development informed by public input, the

governor,[124] CARB, legislative direction, and input by the EJ Advisory Committee.[125,126] Future updates to the Scoping Plan may consider new clean technologies and fuels beyond those included in this Scoping Plan.

The four scenarios evaluated shared many similarities. They each embodied the following characteristics:

- Drastic reduction in fossil fuel dependence, with some remaining in-state demand for fossil fuels for aviation, marine, and locomotion applications, and for fossil gas for buildings and industry
- Ambitious deployment of efficient non-combustion technologies such as zero emission vehicles and heat pumps
- Rapid growth in the production and distribution of clean energy such as zero carbon electricity and hydrogen
- Progressive phasedown of fossil fuel production and distribution activities as part of the transition to clean energy
- Remaining emissions of fugitive SLCPs such as refrigerants and fugitive methane
- Strong consumer adoption of clean technology and fuel options
- Removal of remaining CO_2 emissions to achieve carbon neutrality
- Some reliance on carbon capture and sequestration (CCS)

While the four scenarios had a lot in common, they also had some differences:

- Year in which carbon neutrality is achieved (2035 or 2045)
- Rate of deployment of clean technology and production and distribution of zero carbon energy
- Remaining amount of demand for fossil energy in the year carbon neutrality is achieved
- Constraints on technology and fuels deployed in certain sectors
- Consumer adoption rates of clean technologies and fuels
- Degree of reliance on CO_2 removal
- Degree of reliance on CCS

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[124] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. Retrieved from *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.

[125] EJ Advisory Committee. December 2, 2021. EJ Advisory Committee Responses for the CARB Scenario Inputs. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf*.

[126] CARB. January 25, 2022. Update on PATHWAYS Scenario Modeling Assumptions. *https://ww2.arb.ca.gov/sites/default/files/2022-01/Scenario%20Slides%20for%20Jan25%20EJAC%20Mtg_01242022.pdf*.

The summary below provides an overview of the alternatives designed and considered for the energy and industrial sectors in this update. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*

Scoping Plan Scenario (modeling scenario Alternative 3 from the Draft): carbon neutrality by 2045, deploy a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and align with statutes, Executive Orders, Board direction, and direction from the governor

Alternative 1: carbon neutrality by 2035, nearly complete phaseout of all combustion, limited reliance on carbon capture and sequestration and engineered carbon removal, and restricted applications for biomass-derived fuels

Alternative 2: carbon neutrality by 2035 and aggressive deployment of a full suite of technology and energy options, including engineered carbon removal

Alternative 4: carbon neutrality by 2045, deployment of a broad portfolio of existing and emerging fossil fuel alternatives, slower deployment and adoption rates than the Scoping Plan Scenario, and a higher reliance on CO_2 removal

Other considerations for the AB 32 GHG Inventory sectors include the following:

- To what extent does an alternative meet the statewide targets and any sector targets, and also deliver clean air benefits (especially in the near term) to address ongoing healthy air disparities, prioritize reductions for mobile and large stationary sources, and emphasize continued investment in disadvantaged communities?
- Does an alternative support California in building on efforts to collaborate with other jurisdictions and include exportable policies based on robust science?
- Does an alternative provide for compliance options and a cost-effective approach to reduce GHG emissions?
- Does the alternative present a realistic and ambitious path forward consistent with statute and science, and support economic opportunities, particularly in anticipated growth sectors?

Scenarios for Natural and Working Lands

For the natural and working lands sector, the Reference Scenario shows that NWL will continue to emit GHGs and lose carbon stocks into the future as the combined effects of past unhealthy management practices and climate change impact our lands. Relative to the Reference Scenario, the four NWL scenarios represent different scales of land management on seven landscapes (forests, shrublands/chaparral, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands) to support carbon neutrality.

The analysis of the four NWL scenarios shows that the Scoping Plan Scenario is the preferred choice because it prioritizes sustainable land management to sequester carbon over the long term, GHG and air pollution reductions, ecosystem health and resilience, and implementation and technological feasibility and cost-effectiveness. The Scoping Plan Scenario reduces catastrophic wildfire risk to the state; increases the health and resilience of California's forests, shrublands, and grasslands; increases soil health; and protects, restores, and enhances California's natural and working lands for future generations. The Scoping Plan Scenario takes into consideration the priority landscapes and nature-based strategies identified in California's Climate Smart Strategy[127] and reflects the state's priorities to manage lands in ways that support the multiple benefits they provide. The Scoping Plan Scenario, as well as each of the alternative NWL scenarios, were informed by input from other agencies, the public, and the EJ Advisory Committee. Additional landscapes and land management activities will be added and evaluated in future Scoping Plan updates and in response to AB 1757.

Each of the NWL scenarios have several similarities, including the following:

- Prioritizing NWL management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. These actions can reduce GHG emissions from these lands, protect ecosystems against future climate change, protect communities, and enhance the ecosystem benefits they provide to nature and society.
- Exploring the potential impacts of different levels of NWL management actions that are designed to achieve the objective associated with each scenario.
- Analyzing the carbon impacts of land management actions, climate change, wildfire, and water use on California's diverse natural and working lands through 2045.

There are also differences across the four NWL scenarios. These include:

- The level of NWL management actions taken on each landscape, such as varying the acres of healthy soils practices for croplands.
- The types of NWL management actions taken on each landscape, such as prescribed burning or thinning for forests, grasslands, and shrublands.

[127] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

The summary below provides an overview of the alternatives designed and considered for the NWL sectors in this Scoping Plan. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*.

Scoping Plan Scenario (NWL Alternative 3 from the Draft): land management activities that prioritize restoration and enhancement of ecosystem functions to improve resilience to climate change impacts, including more stable carbon stocks

NWL Alternative 1: land management activities that prioritize short term carbon stocks in our forests and through increased climate smart agricultural practices on croplands

NWL Alternative 2: land management activities representative of California's current commitments and plans

NWL Alternative 4: land management activities that prioritize reducing catastrophic wildfires in forests, shrublands, and grasslands

Evaluation of Scoping Plan Alternatives

CARB staff solicited feedback from topical experts, affected stakeholders, and the EJ Advisory Committee, including a tribal representative, at public meetings to assemble input assumptions for four carbon neutrality scenarios to model using PATHWAYS. Revisions to the Draft Scoping Plan were informed by direction in statute, the Governor's Executive Orders, public comments, and the recommendations of the EJ Advisory Committee. The three alternative scenarios were designed to explore the potential speed, magnitude, and impacts of transitioning California's energy demand away from fossil fuels. The modeling assumptions listed below identify the primary fossil fuel alternative that is commercially available and technically feasible for widespread use by 2045 for each sector. CARB assumes that any energy demand that remains after the alternative technology or fuel is applied—such as on-road internal combustion engines, industrial processes, and gas use in existing buildings that have not yet decarbonized—will continue to be met by fossil fuels, resulting in residual GHG emissions.

NWL Scoping Plan Alternatives

For the NWL sectors, staff significantly expanded the scale of the scientific analysis for NWL from previous Scoping Plan efforts. CARB staff utilized modeling tools for this expanded analysis to assess both the carbon and other ecological, public health, and economic outcomes of management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. CARB staff aligned the scenarios with both the landscape types and actions identified in other efforts called for in Governor Newsom's Executive Order N-82-20 (e.g., California's Climate Smart Strategy and Pathways to 30x30). As part of this Scoping Plan, CARB staff modeled as many of the management actions identified in the Natural and Working Lands Climate

Smart Strategy as were feasible. The management actions that were included in the model were selected because of the State of California's previous work to quantify these actions' impacts. It was not feasible to model every land management strategy for NWL, and so it is possible that larger volumes of sequestration (e.g., in soils or in oceans) could result from additional non-modeled activities. California's Natural and Working Lands Climate Smart Strategy includes a more comprehensive listing of priority nature-based solutions and management actions. It is important to note that the absence of a particular management action or its climate benefit in the modeling is not an indication of its importance or potential contributions toward meeting the target or toward supporting the carbon neutrality target for California.

Forests: Management strategies were modeled for forests: biological/chemical/ herbaceous treatments (e.g., herbicide application), clearcut, various timber harvests (e.g., variable retention, seed tree / shelterwood, selection harvesting), mastication, other mechanical treatments (e.g., piling of dead material, understory thinning), prescribed burning, and thinning. Avoided land conversion to another land use was also included in the modeling. Wildfire was modeled and is responsive to management strategies and climate conditions.

Shrublands and chaparral: Management strategies were modeled for shrublands and chaparral: biological/chemical/herbaceous treatments, prescribed burning, mechanical treatment (e.g., mastication, crushing, mowing, piling), and avoided conversion from shrubland to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Grasslands: Management strategies were modeled for grasslands: biological/chemical/herbaceous treatments, prescribed burning, and avoided land conversion from grasslands to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Croplands: Management strategies were modeled for row crops: cover cropping, no till, reduced till, compost amendment, transition to organic[128] farming, avoided conversion of annual crop agricultural land through easements, establishing riparian forest buffers, alley cropping, establishing windbreaks/shelterbelts, establishing tree and shrubs in croplands, and establishing hedgerows. For perennial crops, windbreaks/shelterbelts, hedgerows, conversion from annual crops to perennial crops, and avoided conversion to other land uses were modeled.

[128] Note: N_2O reductions from decreases in synthetic fertilizer application in organic farming were not modeled.

Developed lands: Management strategies were modeled for developed lands: Increasing tree canopy cover through planting trees and improved management of existing trees, and removing vegetation surrounding structures in accordance with the CAL FIRE Defensible Space PRC 4291.

Wetlands: Management strategies were modeled for wetlands: Restoring wetlands through submerging cultivated land in the Sacramento-San Joaquin Delta and avoided land conversion in the Sacramento-San Joaquin Delta.

Sparsely vegetated lands: Management strategies were modeled for sparsely vegetated lands: Avoided conversion of sparsely vegetated lands to another land use.

Scoping Plan Scenario

The Scoping Plan Scenario achieves GHG emission reductions that exceed the levels expected based on existing policies represented in the Reference Scenario, keeping California on track to achieve the SB 32 GHG reduction target for 2030 and become carbon neutral no later than 2045. Actions that reduce GHG emissions and transition AB 32 GHG Inventory sources away from fossil fuel combustion affect each economic sector. Actions that lead to improved carbon stocks affect each landscape.

AB 32 GHG Inventory Sectors

The AB 32 GHG Inventory Sector Reference scenario is the forecasted statewide GHG emissions through mid-century, with existing policies and programs but without any further action to reduce GHGs beyond those needed to achieve the 2030 limit. The Reference Scenario was developed based on other projections of business-as-usual conditions. Sources of data and policies included are:

- California Energy Demand Forecast[129]
- The two transportation carbon neutrality studies required by AB 74[130]
- The Mobile Source Strategy[131]
- SB 100 60 percent Renewables Portfolio Standard
- A Low Carbon Fuel Standard carbon intensity reduction target of 20 percent

Policies that are under study or design, such the Advanced Clean Fleets regulation, are not included. The Reference Scenario reflects current trends and expected performance of policies identified in the 2017 Scoping Plan—some of which are performing better (such as the RPS and LCFS) and others that may not meet expectations (such as vehicle miles traveled [VMT] reductions and methane capture). Figure 2-1 provides the modeling results for a Reference Scenario for the AB 32 GHG Inventory sectors compared to the Scoping Plan Scenario.

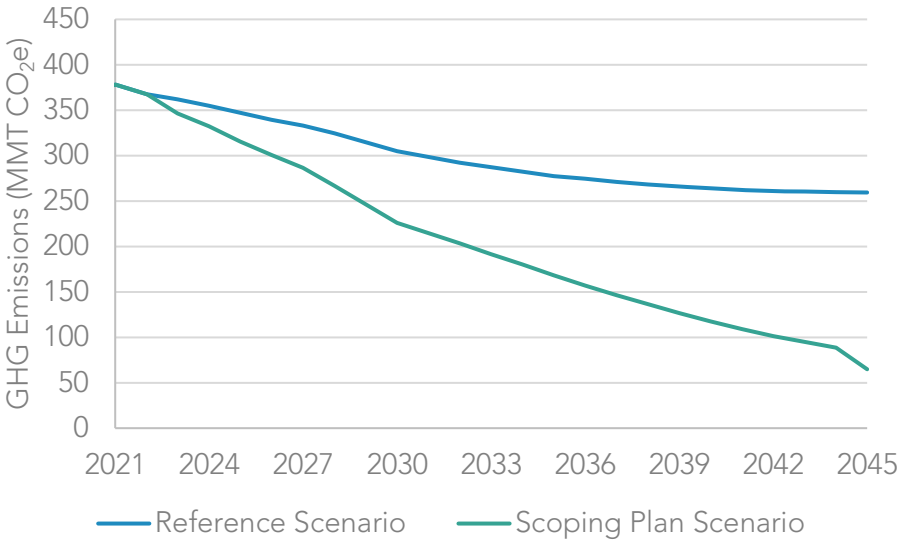
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[129] California Energy Commission (CEC). 2020. *2019 Integrated Energy Policy Report.* https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.

[130] Brown et al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0 and Deschenes et al. 2021. *Enhancing equity.* https://zenodo.org/record/4707966#.Yl72RNrMKUn.

[131] CARB. 2021. 2020 *Mobile Source Strategy.* https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

Figure 2-1: Reference and Scoping Plan Scenario GHG emissions[132]



The Scoping Plan Scenario is summarized in Table 2-1. The table shows the types of technologies and energy needed to drastically reduce GHG emissions from the AB 32 Inventory sectors. It also includes references to relevant statutes and Executive Orders, although it is not comprehensive of all existing new authorities for directing or supporting the actions described. Each action is expected to both reduce GHGs and help improve air quality, primarily by transitioning away from combustion of fossil fuels. The Scoping Plan Scenario achieves the AB 1279 target of 85 percent below 1990 levels by 2045 and identifies a need to accelerate the 2030 target to 48 percent below 1990 levels.

[132] The drop in emissions in 2045 reflects both the need to achieve an 85% reduction below 1990 levels in anthropogenic emissions per AB 1279 and Governor Newsom's request for a 100 MMT CO2e carbon removal and capture target in 2045. This was modeled by extending CCS to electric sector emissions.

Table 2-1: Actions for the Scoping Plan Scenario: AB 32 GHG Inventory sectors

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
GHG Emissions Reductions Relative to the SB 32 Target[133]	40% below 1990 levels by 2030	SB 32: Reduce statewide GHG emissions. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Smart Growth / Vehicle Miles Traveled (VMT)	VMT per capita reduced 25% below 2019 levels by 2030, and 30% below 2019 levels by 2045	SB 375: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. In response to Board direction and EJ Advisory Committee recommendations
Light-duty Vehicle (LDV) Zero Emission Vehicles (ZEVs)	100% of LDV sales are ZEV by 2035	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory 2035 target aligns with the EJ Advisory Committee recommendation.

[133] While the SB 32 GHG emissions reduction target is not an Action that is analyzed independently, it is included in this table for reference.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Truck ZEVs	100% of medium-duty (MDV)/HDV sales are ZEV by 2040 (AB 74 University of California Institute of Transportation Studies [ITS] report)	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Aviation	20% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045. Sustainable aviation fuel meets most or the rest of the aviation fuel demand that has not already transitioned to hydrogen or batteries.	Reduce demand for petroleum aviation fuel and reduce GHGs. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter to CARB Chair Liane Randolph
Ocean-going Vessels (OGV)	2020 OGV At-Berth regulation fully implemented, with most OGVs utilizing shore power by 2027. 25% of OGVs utilize hydrogen fuel cell electric technology by 2045.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Port Operations	100% of cargo handling equipment is zero-emission by 2037. 100% of drayage trucks are zero emission by 2035.	Executive Order N-79-20: Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Freight and Passenger Rail	100% of passenger and other locomotive sales are ZEV by 2030. 100% of line haul locomotive sales are ZEV by 2035. Line haul and passenger rail rely primarily on hydrogen fuel cell technology, and others primarily utilize electricity.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Oil and Gas Extraction	Reduce oil and gas extraction operations in line with petroleum demand by 2045.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Petroleum Refining	CCS on majority of operations by 2030, beginning in 2028 Production reduced in line with petroleum demand.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Electricity Generation	Sector GHG target of 38 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2030 and 30 $MMTCO_2e$ in 2035 Retail sales load coverage[134] 20 gigawatts (GW) of offshore wind by 2045 Meet increased demand for electrification without new fossil gas-fired resources.	SB 350 and SB 100: Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter, Board direction, and EJ Advisory Committee recommendation
New Residential and Commercial Buildings	All electric appliances beginning 2026 (residential) and 2029 (commercial), contributing to 6 million heat pumps installed statewide by 2030	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter

[134] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* reflects the agency authors' understanding that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Existing Residential Buildings	80% of appliance sales are electric by 2030 and 100% of appliance sales are electric by 2035. Appliances are replaced at end of life such that by 2030 there are 3 million all-electric and electric-ready homes—and by 2035, 7 million homes—as well as contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Existing Commercial Buildings	80% of appliance sales are electric by 2030, and 100% of appliance sales are electric by 2045. Appliances are replaced at end of life, contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Food Products	7.5% of energy demand electrified directly and/or indirectly by 2030; 75% by 2045	Reduce demand for fossil gas and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Construction Equipment	25% of energy demand electrified by 2030 and 75% electrified by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Chemicals and Allied Products; Pulp and Paper	Electrify 0% of boilers by 2030 and 100% of boilers by 2045. Hydrogen for 25% of process heat by 2035 and 100% by 2045 Electrify 100% of other energy demand by 2045.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Stone, Clay, Glass, and Cement	CCS on 40% of operations by 2035 and on all facilities by 2045 Process emissions reduced through alternative materials and CCS	SB 596: Reduce demand for fossil energy, process emissions, and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Other Industrial Manufacturing	0% energy demand electrified by 2030 and 50% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Combined Heat and Power	Facilities retire by 2040.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Agriculture Energy Use	25% energy demand electrified by 2030 and 75% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions
Low Carbon Fuels for Transportation	Biomass supply is used to produce conventional and advanced biofuels, as well as hydrogen.	Reduce demand for petroleum fuel and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Low Carbon Fuels for Buildings and Industry	In 2030s biomethane[135] blended in pipeline Renewable hydrogen blended in fossil gas pipeline at 7% energy (~20% by volume), ramping up between 2030 and 2040 In 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

[135] *Biomethane* is also known as renewable natural gas (RNG).

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Non-combustion Methane Emissions	Increase landfill and dairy digester methane capture. Some alternative manure management deployed for smaller dairies Moderate adoption of enteric strategies by 2030 Divert 75% of organic waste from landfills by 2025. Oil and gas fugitive methane emissions reduced 50% by 2030 and further reductions as infrastructure components retire in line with reduced fossil gas demand	SB 1383: Reduce short-lived climate pollutants.
High GWP Potential Emissions	Low GWP refrigerants introduced as building electrification increases, mitigating HFC emissions	SB 1383: Reduce short-lived climate pollutants.

Natural and Working Lands

The Reference Scenario for NWL represents the amount of land management that occurred between 2001 and 2014, and projects the outcomes from maintaining the 2001–2014 levels of land management until 2045. The management and land use practices that occur within the Reference Scenario were derived from empirical data used by staff. For forests, shrublands/chaparral, and grasslands, the Reference Scenario constitutes approximately 250,000 acres of annual statewide treatments. For croplands, the Reference Scenario represents no healthy soil practices because during this period the healthy soil program did not yet exist. For land use change within all land types that consider land use change, historical rates of land conversion from 2001–2014 also were taken from empirical data and modeled into the future for the Reference Scenario.

Table 2-2 summarizes the Scoping Plan Scenario. The table also includes references to relevant statutes and Executive Orders where available.

Table 2-2: Actions for the Scoping Plan Scenario: NWL sectors

Sector	Action	Statutes, Executive Orders, Outcome
Natural and Working Lands	Conserve 30% of the state's NWL and coastal waters by 2030. Implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities—and in particular low-income, disadvantaged, and vulnerable communities.	EO N-82-20 and SB 27: CARB to include an NWL target in the Scoping Plan. AB 1757: Establish targets for carbon sequestration and nature-based climate solutions. SB 1386: NWL are an important strategy in meeting GHG reduction goals.

Sector	Action	Statutes, Executive Orders, Outcome
Forests and Shrublands	At least 2.3 million acres[136] treated statewide annually in forests, shrublands/chaparral, and grasslands, comprised of regionally specific management strategies that include prescribed fire, thinning, harvesting, and other management actions. No land conversion of forests, shrublands/chaparral, or grasslands.	Restore health and resilience to overstocked forests and prevent carbon losses from severe wildfire, disease, and pests. Improve air quality and reduce health costs related to wildfire emissions. Improve water quantity and quality and improve rural economies. Provide forest biomass for resource utilization. EO B-52-18: CARB to increase the opportunity for using prescribed fire. AB 1504 (Skinner, Chapter 534, Statutes of 2010): CARB to recognize the role forests play in carbon sequestration and climate mitigation.

[136] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

Sector	Action	Statutes, Executive Orders, Outcome
Grasslands	At least 2.3 million acres[137] treated includes increased management of grasslands interspersed in forests to reduce fuels surrounding communities using management strategies appropriate for grasslands. No land conversion of forests, shrublands/chaparral, or grasslands.	Help to achieve climate targets, improve air quality, and reduce health costs.
Croplands	Implement climate smart practices for annual and perennial crops on ~80,000 acres annually. Land easements/ conservation on annual crops at ~5,500 acres annually. Increase organic agriculture to 20% of all cultivated acres by 2045 (~65,000 acres annually).	Reduce short-lived climate pollutants. Increase soil water holding capacity. Increase organic farming and reduce pesticide use. SB 859: Recognizes the ability of healthy soils practices to reduce GHG emissions from agricultural lands. Target increased in response to Governor Newsom's direction to prioritize sustainable land management.

[137] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

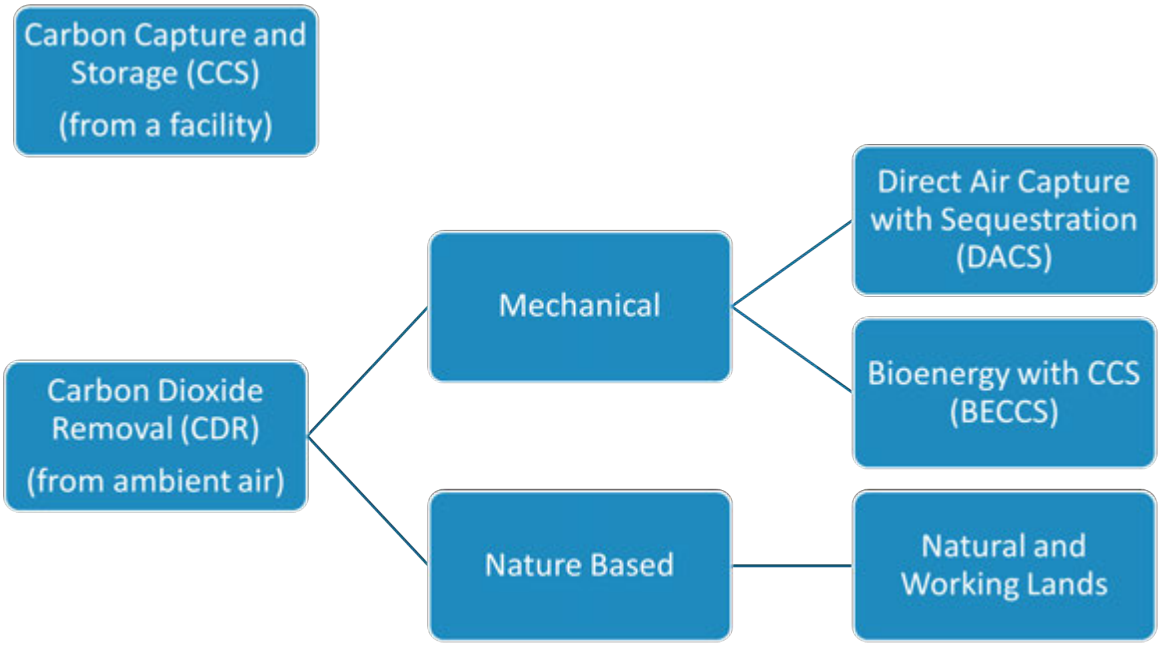
Sector	Action	Statutes, Executive Orders, Outcome
Developed Lands	Increase urban forestry investment by 200% above current levels and utilize tree watering that is 30% less sensitive to drought. Establish defensible space that accounts for property boundaries.	Increase urban tree canopy and shade cover. Reduce heat island effects and support water infrastructure. Reduce fire risk via defensible space. AB 2251 (Calderon, Chapter 186, Statutes of 2022): Increase urban tree canopy 10% by 2035. Target increased in response to AB 2251 and Governor Newsom's direction on CO_2 removal targets in his July 2022 letter.
Wetlands	Restore 60,000 acres of Delta wetlands.	Increase carbon sequestration and reduce short-lived climate pollutants. Helps to reverse land subsidence while improving flood protection and providing critical habitat.
Sparsely Vegetated Lands	Land conversion at 50% of the Reference Scenario land conversion rate.	Reduce the rate of land conversion to more GHG-intensive land uses.

Strategies for Carbon Removal and Sequestration

To achieve carbon neutrality, any remaining emissions must be compensated for using carbon removal and sequestration tools. The following discussion presents more detail

on the options available to capture and sequester carbon. Carbon removal and sequestration will be an essential tool to achieve carbon neutrality, and the modeling clearly shows there is no path to carbon neutrality without carbon removal and sequestration. Governor Newsom also recognized the importance of CO_2 removal strategies and directed CARB to establish CO_2 removal and carbon capture targets of 20 $MMTCO_2$ and 100 $MMTCO_2$ by 2030 and 2045, respectively, as well as signing 2022 legislation on carbon removal and sequestration, including: AB 1279, SB 905, SB 1137, and AB 1757. Carbon removal and sequestration can take different forms. Figure 2-2 illustrates the types of carbon removal and sequestration included in this Scoping Plan. There are numerous other carbon removal options undergoing research, development, and pilot deployment. As these options mature and new approaches emerge, they can be considered in future Scoping Plan updates.

Figure 2-2: Forms of carbon removal and sequestration considered in this Scoping Plan



The Role of Carbon Capture and Sequestration

Carbon capture and sequestration (CCS) will be a necessary tool to reduce GHG emissions and mitigate climate change while minimizing leakage and minimizing emissions where no technological alternatives may exist. CCS is a process by which large amounts of CO_2 are captured, compressed, transported, and sequestered. CCS projects are paired with a source of emissions, as the CCS project captures CO_2 as it leaves a facility's smokestack. CCS projects are often paired with large GHG-emitting facilities such as energy, manufacturing, or fuel production facilities. The sequestration component

of CCS includes CO_2 injection into geologic formations (such as depleted oil and gas reservoirs and saline formations), as well as use in industrial materials (e.g., concrete). CCS is distinct from biological sequestration, which is typically accomplished through NWL management and conservation practices that enhance the storage of carbon or reduce CO_2 emissions with nature-based approaches. CCS is also distinct from mechanical CO_2 removal technologies, where CO_2 is removed directly from the atmosphere using mechanical and/or chemical processes.

CARB adopted a CCS Protocol in 2018 as part of amendments to the Low Carbon Fuel Standard.[138] At this time, no CCS projects have been implemented or have generated any credits under that protocol. However, CCS projects have been implemented elsewhere since the 1970s, largely on coal-fired power plants, with over two dozen projects operational around the world. Over 100 are at the stages of advanced or early development and are expanding beyond coal-fired plants to fossil gas, fuel production, and electricity generation facilities.[139] CCS projects are in development for addressing emissions from fuel, gas, energy production, and chemical production. As of November 2019, more than half of global large-scale CCS facilities (representing approximately 22 $MMTCO_2$/yr in capacity[140]) were in the U.S., mostly as a result of sustained governmental support for these technologies.[141] This support includes the federal 45Q tax credit for CCS[142,143] and research and deployment grants from federal agencies.[144,145] California's deep sedimentary rock formations in the Central Valley represent world-class

[138] CARB. 2022. Carbon Capture & Sequestration. *https://ww2.arb.ca.gov/our-work/programs/carbon-capture-sequestration*.
[139] Global CCS Institute. 2021. *Global Status of CCS 2021.* *https://www.globalccsinstitute.com/wp-content/uploads/2021/11/Global-Status-of-CCS-2021-Global-CCS-Institute-1121.pdf*.
[140] IHS Markit. August 2021. Carbon Removal Potential: An Overview. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.
[141] Beck, Lee. 2019. *Carbon capture and storage in the USA: The role of US innovation leadership in climate-technology commercialization.* *https://academic.oup.com/ce/article/4/1/2/5686277*.
[142] Congressional Research Service. 2021. Carbon Storage Requirements in the 45Q Tax Credit. IF11639. *https://crsreports.congress.gov/product/pdf/IF/IF11639*.
[143] The Inflation Reduction Act of August 2022 expands and enhances the 45 Q tax credit for CCS. Pub.L. No. 117-169 (August 16, 2022).
[144] U.S. Department of Energy. 2020. U.S. Department of Energy Announces $131 Million for CCUS Technologies. *https://www.energy.gov/articles/us-department-energy-announces-131-million-ccus-technologies*.
[145] U.S. Department of Energy. 2021. Funding Opportunity Announcement 2515, Carbon Capture R&D for Natural Gas and Industrial Point Sources, and Front-End Engineering Design Studies for Carbon Capture Systems at Industrial Facilities and Natural Gas Plants. *https://www.energy.gov/fecm/articles/funding-opportunity-announcement-2515-carbon-capture-rd-natural-gas-and-industrial*.

CO_2 storage sites that would meet the highest standards, with storage capacities of at least 17 billion tons of CO_2.[146,147]

In this Scoping Plan, CCS is included to address emissions from limited sectors, including electricity generation, cement production facilities, and refineries, to ensure anthropogenic emissions are reduced by at least 85 percent below 1990 levels in 2045, as directed in AB 1279. While the modeling outputs show CCS not being applied to the electricity sector until 2045, CCS could be implemented earlier on the electricity sector with a similar ramp up over time as that for refineries and cement plants. An earlier application of CCS in the electricity sector would yield additional reductions in years prior to 2045. In addition, CCS can support hydrogen production until such time as there is sufficient renewable power for electrolysis and an abundant water source.

Cement plants have emissions associated with combustion and process-related activities. Combustion emissions account for approximately 40 percent of the total emissions at cement plants. The remaining emissions are related to process-related activities. Due to the high heat content needed to produce cement, there is currently no technically feasible alternative to combustion. SB 596 calls for a 40 percent reduction in GHG intensity in cement emissions from 2019 levels by 2035, and then net zero emissions by 2045. To meet in-state demand, the state relies on cement both produced in state and imported. There are seven cement plants operating in California.[148] To minimize emissions leakage and address emissions from cement plants, the Scoping Plan Scenario includes CCS for cement plants. Additional reductions will need to be pursued and considered as part of implementation of SB 596, which calls for CARB to develop a comprehensive strategy by July 1, 2023, for the state's cement sector to achieve net-zero emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. This effort began in the summer of 2022 and included sector specific workshops.

Even with implementation of EO N-79-20, and despite all of the ambitious efforts in the Scoping Plan Scenario, there will remain some demand for petroleum fuels for legacy vehicles on road applications, and in aviation, rail, and marine applications. Petroleum refineries will need to implement technology to decarbonize their operations and reduce their emissions. This Scoping Plan also assumes CCS at petroleum refineries as one of those potential strategies. Currently, there are seventeen petroleum refineries operating

[146] For comparison purposes, California's emitted 418.2 million metric tons of CO_2e in 2019.
[147] Lawrence Livermore National Laboratory. 2020. *Getting to Neutral: Options for Negative Carbon Emissions in California.* Revision 1. *https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf.*
[148] CARB. Mandatory GHG Reporting – Reported Emissions. *https://ww2.arb.ca.gov/mrr-data*

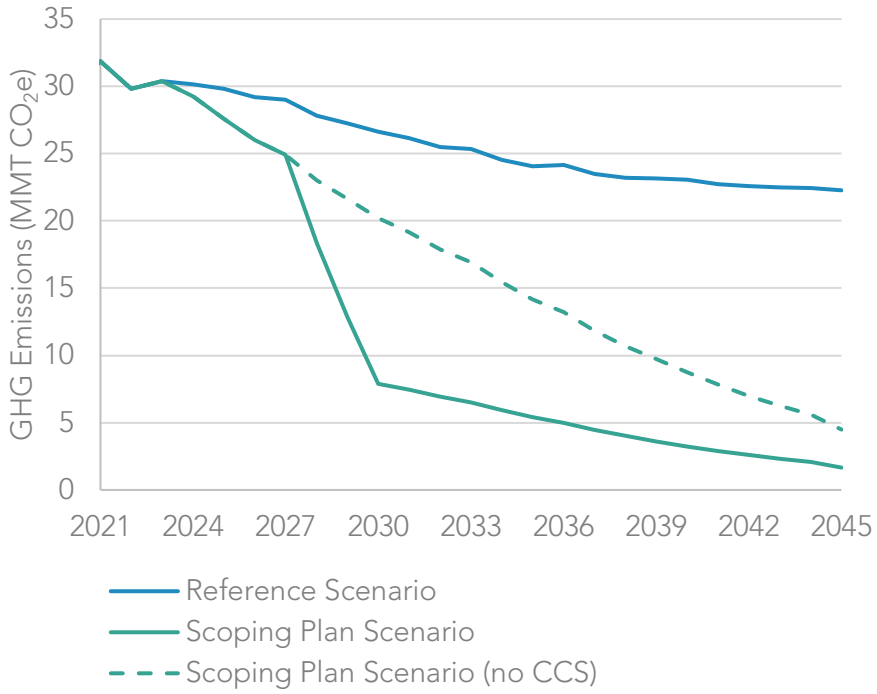
in the state.[149] On the supply side, the modeling assumes all in-state demand is met through some very limited refining activities in California. Figure 2-3 shows the emissions from the refining sector with and without CCS. If CCS is not deployed, the emissions would be directly emitted into the atmosphere, and CO_2 removal by NWL or direct air capture would need to increase to compensate for the sector's emissions.

Refineries can have a variety of point sources that emit CO_2—such as steam methane reformers for producing hydrogen, combined heat and power units, and catalytic crackers—that are best suited for CCS. Each configuration of a refinery can be unique to its footprint, onsite operations, and the types of crude oils processed. There are newer technologies with smaller footprints[150] that can be deployed in modular configurations to capture CO_2 in space-constrained and multiple-point-source facilities such as refineries. CCS can provide a path to reducing GHG emissions from these facilities to meet petroleum demand while avoiding leakage and until such time as some refineries can be transitioned to produce clean energy to support the transition away from fossil fuels.

While the Scoping Plan modeled deployment of CCS on refineries and identifies significant emissions reductions that can be achieved, the refineries in California are large and complex. The actual deployment of CCS at these facilities as modeled in the Scoping Plan is uncertain. It will be important to closely monitor the evolution of CCS deployment in the refinery sector and, in the next Scoping Plan update, to evaluate the progress toward use in this sector to determine whether the projected reductions will be achieved.

[149] CARB. Mandatory GHG Reporting. *https://ww2.arb.ca.gov/mrr-data*.
[150] Carbon Clean. Modular Carbon Capture Systems for Industry. https://www.carbonclean.com/modular-systems?hsLang=en.

Figure 2-3: Petroleum refining emissions with and without carbon capture and sequestration



This Scoping Plan also calls for accelerating the transition from combustion of fossil fuels to hydrogen. Hydrogen can be produced through electrolysis with renewable electricity or through steam methane reformation of biomethane. There is a high degree of uncertainty around the availability of solar to support both electrification of existing sectors and the production of hydrogen through electrolysis. Producing hydrogen required under the Scoping Plan Scenario with electrolysis would require about 10 gigawatts (GW)[151] of additional solar capacity. If steam methane reformation is paired with CCS, the hydrogen produced could potentially be low carbon. Additionally, the biomethane used to generate hydrogen could be sourced from gasification of forest or agricultural waste resulting from forest management and other NWL management practices, which could also lead to net negative carbon outcomes. Steam methane reformation paired with CCS can thus ensure a rapid transition to hydrogen and increase hydrogen availability until such time as

[151] The Draft Scoping Plan included an estimate for solar capacity (40 GW) to support only electrolysis to produce all hydrogen in the Proposed Scenario. The Scoping Plan now includes steam methane reformation of biomethane and biomass gasification with CCS to produce hydrogen, along with electrolysis from off-grid solar. See Appendix H (AB 32 GHG Inventory Sector Modeling) for additional details.

electrolysis with renewables can meet the ongoing need, assuming there is also sufficient water supply. Additional background and next steps for CCS can be found in Chapter 4.

The EJ Advisory Committee has raised multiple concerns related to the inclusion of CCS and mechanical CDR in the Scoping Plan. Concerns range from potential negative health and air quality impacts in communities from operation of facilities utilizing CCS that continue to emit other emissions, to safety concerns related to potential leaks, to the viability of the current technology. Additionally, the EJ Advisory Committee has policy concerns about the strategy and wants to ensure that engineered carbon removal is not used as a substitute for strategies to achieve emissions reductions onsite and that it does not result in delays in phasing out fossil fuel use. Given these and other concerns and the importance of building public awareness, CARB recognizes the need for a multi-stakeholder process including other state, federal, and local agencies; tribes; independent experts; and community residents to further understand and address community concerns related to CCS. CARB hosted a CCS Symposium with U.S. EPA Region 9 and the Stanford Doerr School of Sustainability to discuss some of these critical issues with community members and other participants. As CARB begins the process of implementing SB 905 in 2023, that will provide an opportunity for further engagement.

In the context of CCS deployment, the Council of Environmental Quality (CEQ) also highlighted the need to further assess and quantify potential impacts on local criteria air pollutants and other emissions resulting from carbon capture retrofits at industrial facilities in response to concerns regarding potential cumulative emissions from single and/or multiple sources.[152] An October 2020 Stanford report[153] discussed how the potential post-combustion capture for CO_2 could also reduce emissions of criteria air pollutant emissions from certain facilities. Exploring these potential outcomes will be important to ensure deployment of CCS does not exacerbate air pollution impacts in communities and maximizes any air pollution benefits. The need for these types of evaluations is also included in SB 905.

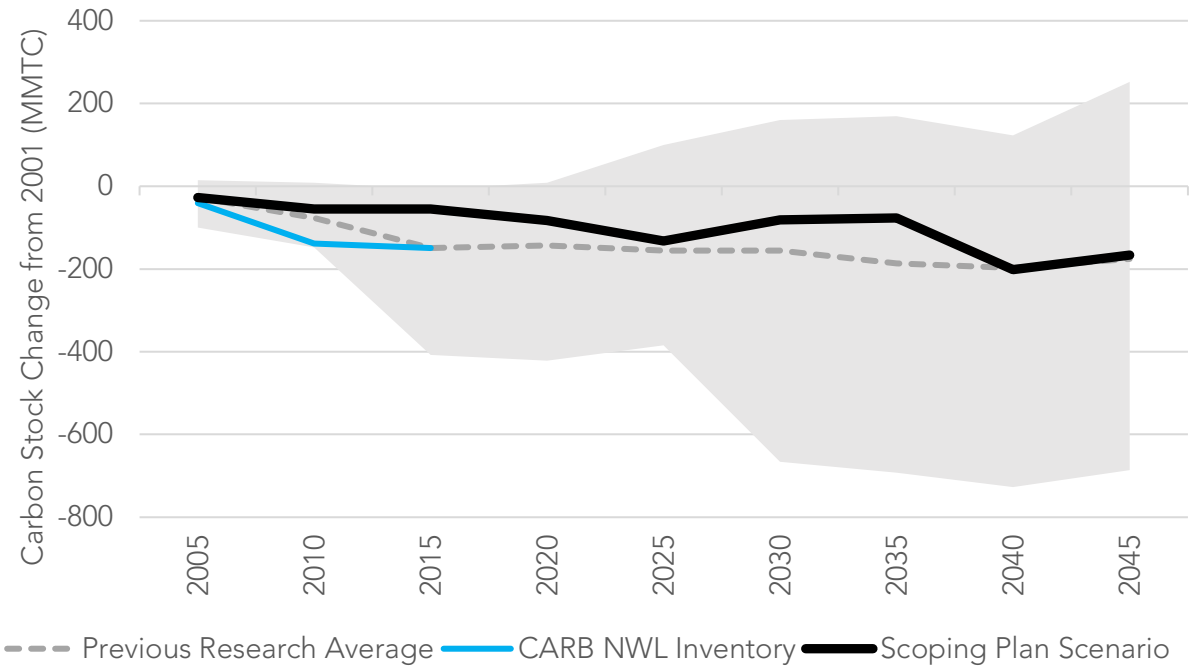
The Role of Natural and Working Lands Emissions and Sequestration

California's NWL assessments highlight the importance of increasing the pace and scale of NWL actions to ensure that our ecosystems are better equipped to withstand future climate change so they continue to provide the benefits that nature and society depend

[152] Carbon Capture, Utilization, and Sequestration Guidance. 87 Fed. Reg. 8808 (Feb. 16, 2022), *2022-03205.pdf (govinfo.gov)*.
[153] Stanford Center for Carbon Storage. 2020. *An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions.* October. *https://sccs.stanford.edu/ccs-in-ca/full-report-form?msclkid=6f9177f6c57811ecbebc473e75203b21*.

upon for survival. As climate change increases the likelihood of extreme wildfires, drought, heat, and other impacts, carbon stocks in California's NWL will face increased risks and impacts. We know from previous climate change and Scoping Plan work[154] that lands can be a net source of GHG emissions or a net sink, and that the magnitude of carbon stock changes and GHG emissions and sequestration from NWL are dependent on the effects of climate change and land management. The expanded modeling conducted for this Scoping Plan shows that NWL are projected to be a net source of emissions through 2045 and indicates a probable decrease of carbon stocks into the future. This projection is further corroborated by previous, independent research that has reached the same conclusion, showing a range of varying levels of carbon stock loss. Figure 2-4 shows the modeling results of the Scoping Plan Scenario overlaid with the NWL inventory and findings from independent research.

Figure 2-4: Comparison of the Scoping Plan Scenario (NWL) with existing research



The modeling indicates that immediate and aggressive climate action can reduce the environmental impacts that would occur in the absence of this action. The results of the modeling demonstrate that regular NWL management over the next two decades can

[154] CARB. 2019. January 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. https://ww2.arb.ca.gov/sites/default/files/2020-10/draft-nwl-ip-040419.pdf.

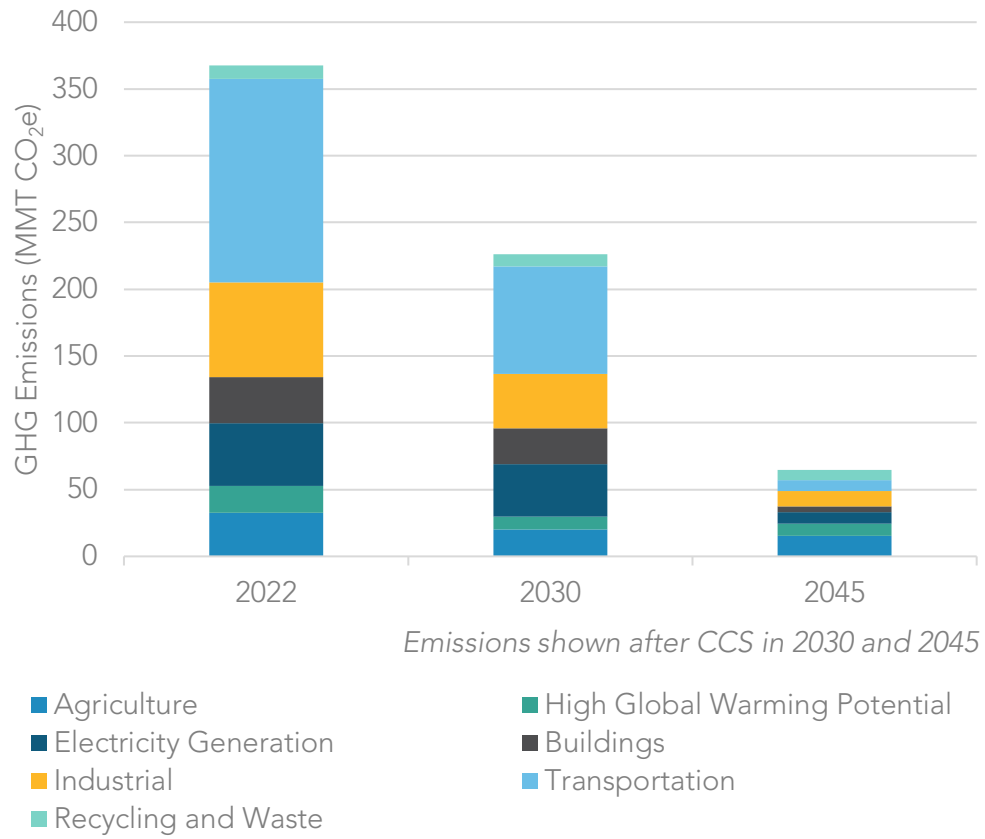
increase carbon stocks from the Reference Scenario trajectory, reduce GHG emissions from lands, and improve ecosystem and public health. This effort is the most comprehensive scientific effort taken by any government to include NWL within its overall climate strategy. Even so, we know that uncertainty exists about future climate and economic forces and the impacts they may have on our ecosystems, so it is important that the state take decisive and aggressive action to improve and diversify ecosystem structures and management.

The effects of climate change, including increased drought, wildfire, and extreme heat, play a significant role in determining the future of California's carbon stocks. And while management actions will help to reduce the impact that climate change will have on California, it is clear from the analysis that NWL sinks and sources are highly variable from year to year, and short time frames do not adequately demonstrate the impact that climate and management are having on ecosystems. For the purposes of climate planning, therefore, it is best to focus on carbon stock changes over longer periods rather than focusing on sequestration or emissions on shorter time frames. The Scoping Plan Scenario is estimated to result in additional NWL emissions of 7 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) annually from 2025–2045. The Reference Scenario is estimated to result in annual emissions of 9 $MMTCO_2e$ over the same time period, and so the Scoping Plan Scenario slows the rate of emissions and provides an approximate 2 $MMTCO_2e$ in additional annual sequestration relative to the Reference Scenario. Because NWL are projected to be a net emissions source, the annual NWL emissions of approximately 7 $MMTCO_2e$ from the Scoping Plan Scenario will need to be compensated by additional CO_2 removal approaches to ensure California can achieve carbon neutrality by 2045.

The Role for Carbon Dioxide Removal (Direct Air Capture)

Even if anthropogenic emissions are reduced to at least 85 percent below 1990 levels by 2045 as called for by AB 1279, there will still be residual emissions in the AB 32 GHG Inventory sectors in 2045 that must be addressed in order to achieve the California's carbon neutrality target. Figure 2-5 includes the emissions by sector for the AB 32 GHG Inventory Sectors in 2022, 2030, and 2045 for the Scoping Plan Scenario.

Figure 2-5: Residual emissions in 2022, 2030, and 2045 for the Scoping Plan Scenario[155]



To achieve carbon neutrality, mechanical CDR will therefore need to be deployed. Because NWL management is not estimated to be a significant carbon removal path in the near term, additional CDR options will be needed. *Mechanical CDR* refers to a range of technologies that capture and concentrate ambient CO_2. Direct air capture (DAC) is one available option that is under development today and could be widely deployed. Note that, unlike CCS, DAC technologies are not designed to be attached to a specific source or smokestack. These technologies include chemical scrubbing processes that capture CO_2 through absorption or adsorption separation processes. Another carbon removal

[155] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily hydrofluorocarbons (HFCs), are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

option that involves rapid mineralization of CO_2 at the Earth's surface is called *mineral carbonation.*[156] As is the case with CCS, mechanical CDR technologies will need governmental or other incentive support to overcome technology and market barriers. In the United States, the U.S. Department of Energy announced financing specifically for DAC in March 2020[157] and March 2021.[158] Additionally, almost $9 billion in CCS support was included in the $ 1 trillion Infrastructure Investment and Jobs Act of 2021.[159] This includes funding to establish four DAC hubs. The Inflation Reduction Act of 2022[160] increases the value of the 45Q tax credit to USD 85 per metric ton of CO_2 captured and stored in geologic formations from some industrial applications and USD 180 per metric ton for DAC with storage in geologic formations. In 2021, there were approximately 19 DAC facilities globally.[161]

Ultimately, the role for mechanical CDR will depend on the success of reducing emissions directly at the source in the AB 32 GHG Inventory sectors and the ability of the NWL to sequester carbon. However, mechanical CDR also provides an opportunity to not just achieve carbon neutrality, but also remove legacy GHG emissions from the atmosphere. As such, increased deployment of DAC can help achieve net negative emissions. This would further help avoid the most damaging impacts of climate change. While the federal incentives for DAC provide some support for this technology, the only California program that recognizes this technology is the LCFS program. Permitting must also happen across different levels of government and across multiple state agencies. Energy availability must also be addressed if DAC is to be implemented in remote areas. Additional information and next steps on DAC can be found in Chapter 4.

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[156] The National Academies Press. 2018. Direct Air Capture and Mineral Carbonation Approaches for Carbon Dioxide Removal and Reliable Sequestration: Proceedings of a Workshop–in Brief. *https://nap.nationalacademies.org/catalog/25132/direct-air-capture-and-mineral-carbonation-approaches-for-carbon-dioxide-removal-and-reliable-sequestration#:~:text=National%20Academies%20of%20Sciences%2C%20Engineering%2C%20and%20Medicine%3B%20Division,concentrate%20carbon%20dioxide%20%28CO%202%29%20from%20ambient%20air*.

[157] U.S. Department of Energy. 2020. Department of Energy to Provide $22 Million for Research on Capturing Carbon Dioxide from Air*. https://www.energy.gov/articles/department-energy-provide-22-million-research-capturing-carbon-dioxide-air*.

[158] U.S. Department of Energy. 2021. DOE Invests $24 Million to Advance Transformational Air Pollution Capture. *https://www.energy.gov/articles/doe-invests-24-million-advance-transformational-air-pollution-capture*.

[159] Pub.L. No. 117-58 (November 15, 2021). *https://www.congress.gov/bill/117th-congress/house-bill/3684/text*.

[160] Pub.L. No. 117-169 (August 16, 2022). *https://www.congress.gov/bill/117th-congress/house-bill/5376/text*.

[161] International Energy Agency (IEA). 2022. Direct Air Capture – Analysis. *https://www.iea.org/reports/direct-air-capture*.

Carbon Dioxide Removal and Capture Targets for 2030 and 2045

Recognizing the importance of CO_2 removal, Governor Newsom and the Legislature identified the need for targets to send policy and regulatory signals to pilot, deploy, and scale action for those efforts. Governor Newsom requested that CARB set a CO_2 removal and capture target of 20 MMT for 2030 and 100 MMT for 2045, first prioritizing sequestration in NWL. And while this Scoping Plan prioritizes and recommends significant increased climate-smart action on all NWL to support carbon neutrality and healthy and resilient lands, the modeling indicates that, across all NWL, lands will be a net source of emissions when accounting for both carbon sequestration and GHG (CO_2, CH_4, and N_2O) emissions from lands.

Some landscapes, however, are projected to have a net increase in carbon stocks under the Scoping Plan Scenario between 2025 and 2045 relative to the reference case, indicating that NWL actions can help California achieve Governor Newsom's CO_2 removal targets. Carbon stocks in urban forests and grasslands are projected to increase relative to historical levels from implementation of the 2022 Scoping Plan. To support the governor's CO_2 removal targets, CARB estimates that lands would contribute an average of 1.5 MMT of CO_2 removals each year between 2025 and 2045. Any carbon sequestration contributions from lands need to reflect both long-term storage and an overall net increase in carbon stocks over time to ensure these NWL actions are contributing toward California's achievement and maintenance of carbon neutrality over time.

CARB will work to update and revise these estimates as part of implementation of AB 1757, which was signed by the governor in September 2022 and requires that CARB and the California Natural Resources Agency (CNRA) work with an expert advisory committee to determine an ambitious range of carbon sequestration targets by January 1, 2024, for the years 2030, 2038, and 2045.

For the AB 32 GHG Inventory sectors, the Scoping Plan Scenario modeling indicates that the scenario would meet or exceed the 2030 SB 32 target through GHG reduction policies without the need for CDR. CDR will, however, be necessary to increase ambition for an accelerated 2030 target and in increasing amounts over the following decades to achieve carbon neutrality by 2045.[162] Given the likelihood of NWL to be a net source of emissions, and the need for CDR to compensate for residual emissions to achieve carbon neutrality

[162] The modeled scenarios assume that residual emissions will be compensated using DAC technologies by including the direct cost in terms of dollars per ton CO_2 removed. The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero carbon options consistent with the carbon neutrality targets in this Scoping Plan.

by 2045, California will need increasing deployment of mechanical CDR over the coming decades. In the immediate future, scaling nature-based CDR approaches also can help to provide some CO_2 removal quickly while mechanical CDR is scaled up between now and 2045. Table 2-3 provides estimates of CO_2 removal and capture needed in 2030[163] and 2045.

[163] As identified in Chapter 1, SB 27 (Skinner, Chapter 237, Statues of 2021) directed CARB to "establish carbon dioxide removal targets for 2030 and beyond" as part of this Scoping Plan. CARB is establishing these targets to satisfy both the requirements of SB 27 and the directive from Governor Newsom to establish CO_2 removal targets for 2030 and 2045.

Table 2-3: GHG emissions and removals needed to achieve carbon neutrality and meet the 20 $MMTCO_2$ removal and capture target in 2030 and the 100 $MMTCO_2$ removal and capture target in 2045.[164]

	2030 ($MMTCO_2e$)	2045 ($MMTCO_2e$)
GHG Emissions	233	72
AB 32 GHG Inventory Sector Emissions	226	65
Net NWL GHG Emissions Across All Landscapes (annual average from 2025–2045)	7	7
Carbon Capture and Sequestration (CCS): Avoided GHG Emissions from Industry and Electric Sectors	(13)	(25)
Carbon Dioxide Removal (CDR) including natural and working lands carbon sequestration,[165] Direct Air Capture, and Bioenergy with CCS (BECCS).	(7)	(75)
Net Emissions (GHG Emissions + CDR)	226	(3)

In 2030, the CO_2 removal and capture target is 20 MMT, but because the SB 32 target only encompasses the AB 32 GHG Inventory sectors, only CCS that reduces GHG emissions on AB 32 sources count toward achieving more ambitious GHG emission reductions in 2030. In 2045, the CO_2 removal and capture must compensate for any residual emissions from the AB 32 Inventory sectors and NWL emissions to support achieving carbon neutrality while also totaling at least 100 MMT. It is important to note that NWL, particularly forests, need a natural wildfire cycle to remain healthy. While the modeling projected wildfires, and implementing the Scoping Plan will result in a reduction in future wildfire emissions, getting to zero wildfires in the sector is not the goal, nor the

[164] Modeled estimates from the Scoping Plan Scenario indicate the relative quantity of emissions and removals to achieve carbon neutrality and meet carbon removal and capture targets. These estimates are not intended to imply precision, as the required policies are yet to be implemented and all models have some uncertainty in their forecasts.

[165] For the purposes of quantifying how to achieve the governor's 20 MMT and 100 MMT CO_2 removal and capture target, CARB included 1.5 $MMTCO_2e$ sequestration from NWL, which is the sequestration from urban forests. This is included as CO_2 removal because it is this sequestration that CARB can consider as having some permanence. Permanence is necessary for incorporating NWL into carbon neutrality. The net NWL emissions of 7 $MMTCO_2e$, identified in the second row of Table 2-3, includes *all* emissions and sinks from all NWL landscapes, which is inclusive of the 1.5 $MMTCO_2e$ sequestration. CARB will develop an accounting framework to accommodate NWL carbon stocks.

right approach to a sustainable forestry sector. In contrast in 2045, the reductions from programs and policies are estimated to reduce emissions by 169 $MMTCO_2e$ from business as usual.

The 2030 target for engineered CDR also provides a near term milestone for California and can serve as an important marker for progress in deploying CDR to support California's carbon neutrality goal. Preliminary estimates indicate that, globally, capacity from already announced projects will range from about 2 million metric tons per year ($MMTCO_2/y$) to 8 $MMTCO_2/y$ from bioenergy paired with CCS, and from about 2,000 metric tons per year ($MTCO_2/y$) to 1 $MMTCO_2/y$ from DACs by 2027,[166] which indicates that California's 2030 target is an ambitious, but achievable, goal.

Scenario Uncertainty

Greenhouse Gas Emissions Modeling

Several types of uncertainty are important to understand in both forecasting future emissions and estimating the benefits of emission reduction actions. In developing this Scoping Plan we forecasted a reference scenario and estimated the GHG emissions outcome of the AB 32 GHG Inventory sectors using the PATHWAYS[167] model. Inherent in the reference scenario modeling is the expectation that many of the existing programs will continue in their current form, and that the expected drivers for GHG emissions, such as energy demand, population growth, and economic growth, will match our current projections.

However, there is also the expectation that each of the policies included and implemented to achieve the 2030 target in the 2017 Scoping Plan will deliver their exact outcomes. It is unlikely the future will precisely match our projections, and this will lead to uncertainty in the forecast. For example, we never could have foreseen and forecasted economic and emissions impacts related to the extended disruptions from the COVID-19 pandemic. Thus, the single "reference" or "forecast" line should be understood to represent one possible future in a range of possible predictions. For this Scoping Plan, PATHWAYS utilized inputs that reflect technically feasible levels of deployment or adoption of low- or zero-carbon fuels and technologies. Each of the input assumptions provided to PATHWAYS has some uncertainty, which also contributes to uncertainty in the resulting reference scenario.

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[166] IHS Markit. August 2021. Carbon Removal Potential. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.
[167] See Appendix H (AB 32 GHG Inventory Sector Modeling).

Similarly, for the NWL modeling, CARB used a mix of individual modeling tools[168] to estimate the carbon and other ecological, public health, and economic outcomes. The Reference scenario assumes that the level of land management actions that occurred between 2001 and 2014 for forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands continues into the future. Alternative scenarios assessed the effect of increasing levels of management actions from the reference scenario beginning in 2025. There is a great deal of uncertainty about exactly how lands are currently managed, and a larger uncertainty about how they may be managed in the future. For NWL, it is unlikely that the future will precisely match the carbon stock outcomes CARB has projected, particularly given the uncertainties around current and future land management and the effects climate change will have on our lands. For any modeling exercise these uncertainties exist; however, this modeling effort brings together the best available science, data, and models to quantify the impact our actions may have on the landscape under an unknown future.

Implementation

As this Scoping Plan is designed to chart a path to achieving carbon neutrality, additional work will be required to fully design and implement any policies and actions identified in this plan. During the subsequent development of policies, the Legislature, CARB, and other state agencies will learn more about the technologies and their costs, as well as how each industry works, as a more comprehensive evaluation is conducted in coordination with stakeholders, including community engagement. Significant areas of uncertainty include permitting wait times[169] and local ordinances that might limit or slow the build-out of utility scale renewables.[170,171] In another example, times to reach commercial operations for solar projects after securing an interconnection agreement also have increased in recent years, to 3.5 to 5.5 years.[172]

The level of natural and working lands climate action identified in this Scoping Plan is ambitious. Achieving the level of action needed to result in the quantified carbon,

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[168] See Appendix I (Natural and Working Lands Technical Support Document).
[169] CEC. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100#anchor_report.
[170] Roth, Sammy. 2019. "California's San Bernardino County slams the brakes on big solar projects." *Los Angeles Times.* https://www.latimes.com/business/la-fi-san-bernardino-solar-renewable-energy-20190228-story.html?fbclid=IwAR2qHGq3bahHme6SFErLsnyFi9UPIfBHIhvnOh3dU3OM7kUTMcEqYfN3pQA.
[171] Chediak, Mark. 2021. "California NIMBYs Threaten Biden's Clean Energy Goals." *BNN Bloomberg.* https://www.bnnbloomberg.ca/california-nimbys-threaten-biden-s-clean-energy-goals-1.1634351?msclkid=668c9ae9c11311ec92e34035ea157ad4.
[172] Rand, Joseph, et al. 2022. Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2021. Power Point Presentation. Lawrence Berkeley National Laboratory. https://emp.lbl.gov/sites/default/files/queued_up_2021_04-13-2022.pdf.

emissions, health, and economic outcomes within this Scoping Plan requires coordination, investment, and partnerships across all levels of government and sectors of the economy. It is possible that not all of the actions at the identified level will begin in 2025. This uncertainty will result in diminished levels of beneficial outcomes quantified in the Scoping Plan Scenario. The levels of NWL action identified in this Scoping Plan represent CARB's assessment of the pace and scale of action needed to achieve the carbon stock targets and CO_2 removal targets identified in this Scoping Plan.

The Scoping Plan Scenario identifies that 2.3 million acres of forests, shrubland, and grassland management annually would achieve substantial levels of fire emissions reductions and the concomitant health and economics benefits. Currently, 1 million acres of forest treatment annually is the joint federal and state government goal (500,000 acres each). This target of one million acres annually by 2025 is for the purposes of increasing forest health and wildfire resilience in the near term, whereas the 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045. By identifying 2.3 million acres of climate action annually in forests, shrublands, and grasslands, this Scoping Plan emphasizes the importance of that 1 million acre annual goal as a milestone on the way to even more action and improved fire and air quality outcomes. The modeling indicates that substantial improvements to statewide fire emissions will occur at levels of action greater than 1 million acres per year. If these levels of action do not occur starting in 2025, the Scoping Plan has quantified climate benefits that will still occur, but to a lesser extent. In terms of fire emissions, compared to the Reference Scenario, 2.3 million acres of forest, shrubland and grassland management will result in a 10% reduction in wildfire emissions. At 1 million acres per year, this decreases to a 2.5% reduction. If 1 million acres per year is also not accomplished, then the emissions and health benefits are even lower.

Climate action in other NWL sectors also generates many co-benefits. Climate action identified in this Scoping Plan is aimed at not only fighting climate change but also improving air quality and public health. The climate action identified in the agricultural sector, for example, should result in decreased pesticide and synthetic fertilizer use. This decrease of synthetic chemical use in agriculture across California also should result in improved public health, especially for communities that work and live in and around agricultural lands. However, as with the forestry sector, the benefits of climate action in agricultural lands and in any other land are dependent on how much implementation takes place. Ramping up increased healthy soils practices and increasing organic agriculture in California will require continued and sustained implementation by private industry and public agencies. For example, achieving the carbon stock outcomes for the annual crops called for in this Scoping Plan would require deployment and maintenance of healthy soils practices on 80,000 additional acres of croplands in California every year between 2025 and 2045. For context, CDFA's Healthy Soils Program, which is an incentive program

supporting healthy soils practices, took almost four years of sustained funding to achieve approximately 50,000 acres total under healthy soils practices.[173]

Given the uncertainty around the modeling assumptions, and performance uncertainty as specific policies are fully designed and implemented, estimates associated with the Scoping Plan Scenario are certain to be different than what is ultimately implemented. One way to mitigate for this is to develop policies that can adapt and increase certainty in GHG emissions reductions. Periodic reviews of progress toward achieving the 2030 target and longer term deeper decarbonization, as well as performance of specific policies, also provide opportunities for the state to consider any changes to ensure we remain on course to achieve the 2030 target and carbon neutrality. The need for this periodic review process was anticipated in AB 32, as it calls for updates to the Scoping Plan at least once every five years. For this Scoping Plan, the metrics provided on the rate of deployment of clean fuels and technologies, along with the annual AB 32 GHG Inventory, provide additional information that can be used to assess progress on sectors and aggregate emissions. This is also true of CARB's NWL carbon inventory. An uncertainty analysis for achieving an accelerated 2030 target is provided toward the end of this chapter.

Targeted Evaluations for the Scoping Plan: Oil and Gas Extraction and Refining

To achieve California's air quality and climate goals, we must end our dependence on petroleum. This will not happen overnight. There are about 28 million combustion engine heavy- and light-duty trucks and passenger vehicles in California, and these are almost always replaced at their end of life. The ZEV Executive Order (EO N-79-20) calls for 100 percent new ZEV car sales beginning in 2035 and a 100 percent ZEV medium- and heavy-duty fleet sales by 2045 where feasible. The result is an ongoing, albeit shrinking, pool of vehicles that will continue to require petroleum fuels. To avoid leakage, as called for in AB 32, and to meet that remaining demand for petroleum fuel, a complete phaseout of oil and gas extraction and refining is not possible by 2045. This Scoping Plan assumes a phasedown in both oil and gas extraction as well as petroleum refining in line with the reduction in demand for in-state on-road petroleum fuel demand. Since the transportation sector is the largest source of GHG emissions and harmful local air pollution, we must continue to research and invest in efforts to deploy zero emissions technologies and clean fuels, and to reduce VMT. An assessment of ongoing progress and efforts to reduce

[173] California Department of Food and Agriculture. 2021. *Incentives Program 2017–2020 Summary by the Numbers.* https://www.cdfa.ca.gov/oefi/healthysoils/docs/HSP_Incentives_program_level_data_funded_projects.pdf.

demand for petroleum fuels and of opportunities to phase down oil and gas extraction and refining will be included in the next Scoping Plan update.

In addition to supplying in-state demand, California is a net exporter of gasoline, diesel, and jet fuel. California pipelines supply the Nevada and Arizona regions[174] with approximately 87 million barrels gasoline equivalent of refined products annually.[175] California pipelines deliver approximately 85% of Nevada's and 40% of Arizona's refined product. Most finished fuels flowing from California to Nevada and Arizona are currently produced by California refineries. To manage the phasedown of oil and gas extraction and petroleum refining in California, exports of finished fuels must be considered and factored into that process, in addition to the declining in-state demand. The authorities and considerations related to supply and demand of petroleum fuels span federal, state, and local agencies. If supply of fossil fuels is to decline along with demand, a multi-agency discussion is needed to systematically evaluate and plan for the transition to ensure that it is equitable.

This inter-agency work should also consider related topics, such as the following:

- Direct and indirect job and economic impacts
- Demand for other liquid fuel types such as renewable fuels, and expected volumes
- Legal considerations
- Public health benefits
- Demand and supply strategies for petroleum fuels, including how to avoid short term supply constraints that may impact low-income consumers

Some of these topics were also discussed as part of two studies[176] supported by the California Environmental Protection Agency, which can serve as a starting point for a working group to analyze these questions and develop policy recommendations.

Oil and Gas Extraction

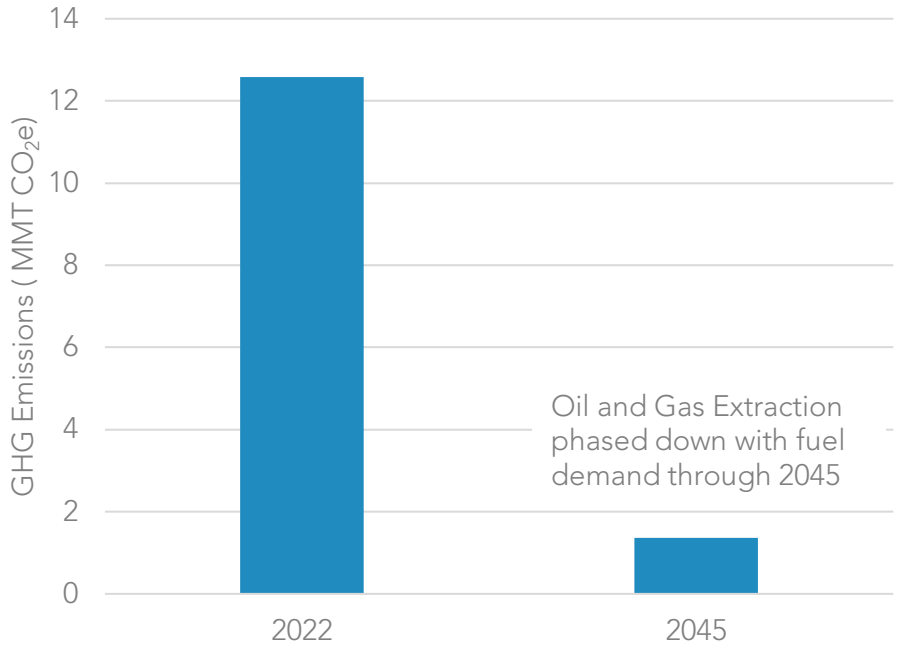
On April 23, 2021,[177] Governor Newsom directed CARB to evaluate the phaseout of oil and gas extraction no later than 2045 as part of this Scoping Plan. As noted above, this Scoping Plan still has some California demand for finished fossil fuels (gasoline, diesel,

[174] CEC. August 2021. A Primer on California's Pipeline Infrastructure. *Petroleum Watch.* *https://www.energy.ca.gov/sites/default/files/2021-08/August_Petroleum_Watch_ADA.pdf*.
[175] CEC. March 2020. *Petroleum Watch.* *https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf*.
[176] CalEPA. 2021. Carbon Neutrality Studies: *https://calepa.ca.gov/climate/carbon-neutrality-studies/*.
[177] Governor Newsom. April 23, 2021. Governor Newsom Takes Action to Phase Out Oil Extraction in California. Press Release. *https://www.gov.ca.gov/2021/04/23/governor-newsom-takes-action-to-phase-out-oil-extraction-in-california/*.

and jet fuel) in 2045. This demand is primarily for transportation, including for sectors that are directly regulated by the state and some that are subject to federal jurisdiction, such as interstate locomotives, marine, and aviation. As discussed more fully below, while significant GHG reductions from oil and gas extraction could be achieved as demand for fossil fuels is reduced due to strategies in this Scoping Plan, it is not feasible to phase out oil and gas production fully by 2045 given this remaining demand.

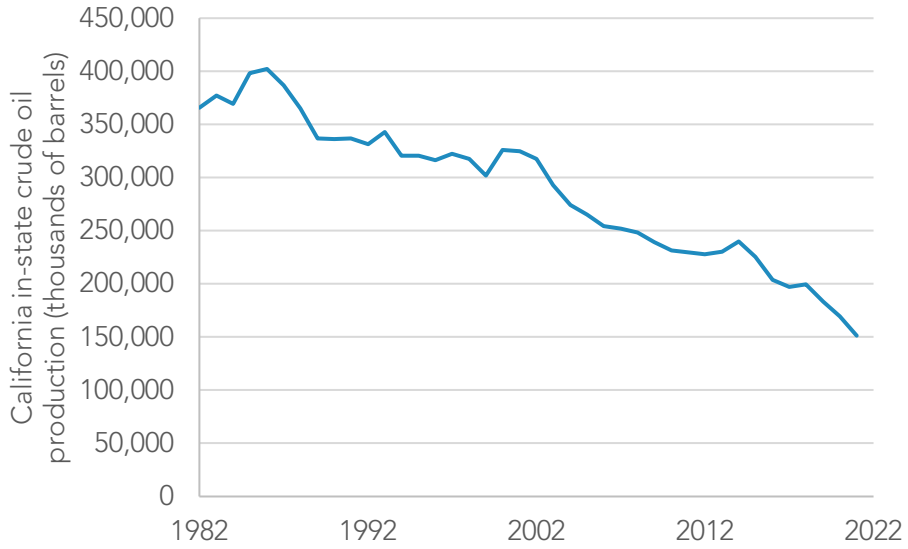
In the Scoping Plan Scenario, with successful deployment of zero carbon fuels and non-combustion technology to phase down petroleum demand, GHG emissions from oil and gas extraction could be reduced by approximately 89 percent in 2045 from 2022 levels if extraction decreases in line with in-state finished fuel demand. If in-state extraction were to be phased out fully, the future petroleum demand by in-state refineries would be met through increased crude imports to the state relative to the Scoping Plan Scenario. AB 32 defines leakage as, "a reduction in emissions in greenhouse gases within the state that is offset by an increase in emissions of greenhouse gases outside the state." AB 32 also requires any actions undertaken to reduce GHGs to "minimize leakage." Increases in imported crude could result in increased activity outside California to extract and transport crude into California. Therefore, our analysis indicates that a full phaseout of in-state extraction could result in GHG emissions leakage and in-state impacts to crude oil imported into the state. Figure 2-6 compares the 2022 emissions from this sector with the modeled results when the sector is phased down with in-state petroleum demand.

Figure 2-6: Oil and gas extraction sector GHG emissions in 2022 and 2045 when activity is phased down with in-state fuel demand



According to California Energy Commission (CEC) data used in Figure 2-7, the total oil extracted in California peaked at 402 million barrels in 1986. Since then, California crude oil production has decreased by an average of 6 million barrels per year, to about 200 million barrels in 2020. This steadily decreasing production of crude in California is expected to continue as the state's oil fields deplete.

Figure 2-7: California in-state crude oil production[178]



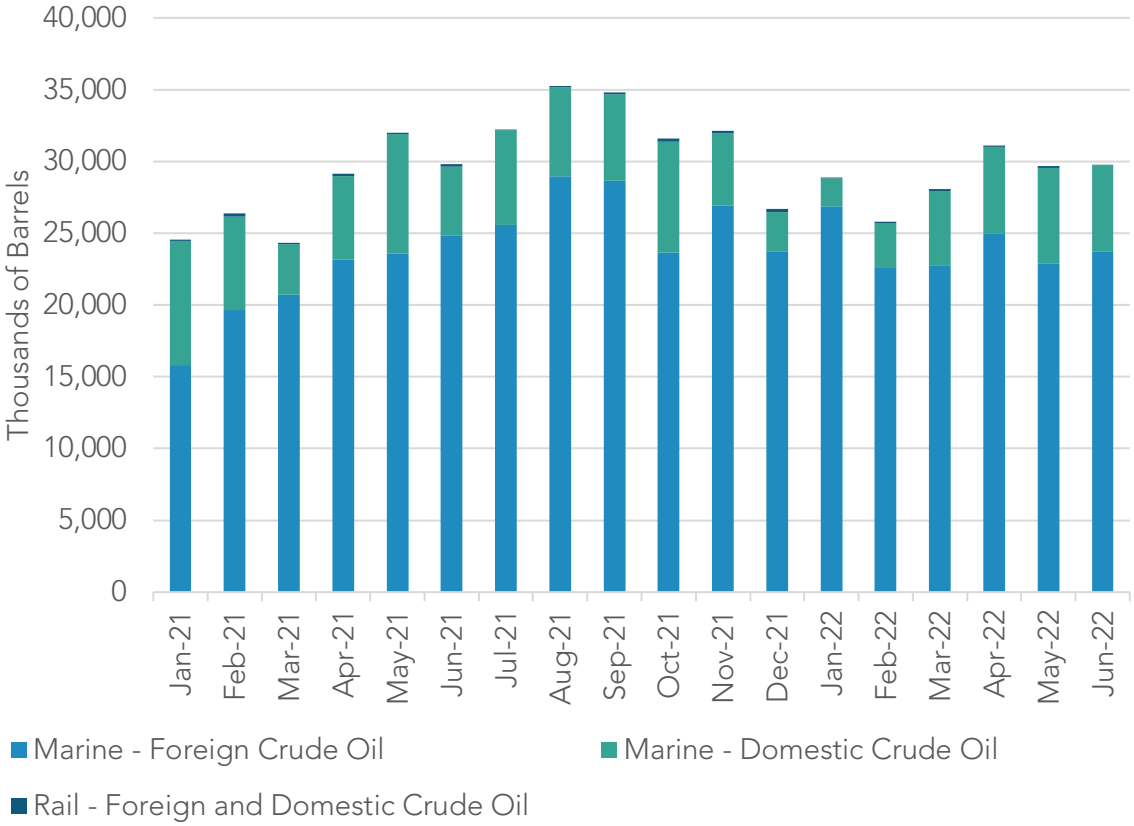
A UC Santa Barbara report estimated that, under business-as-usual conditions, California oil field production would decrease to 97 million barrels in 2045.[179] The business-as-usual model assumed no additional regulations limiting oil extraction in California.

Any crude oil demand by California refineries not met by California crude oil will be met by marine imports of Alaskan and foreign crude.[180] As shown in Figure 2-8, approximately 99 percent of crude imports into California are delivered by marine transportation. The

[178] CEC. No date. Oil Supply Sources to California Refineries. Accessed April 21, 2022. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries.
[179] University of California, Santa Barbara. 2021. Enhancing Equity While Eliminating Emissions in California's Supply of Transportation Fuels.
[180] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf, and CEC. 2020. *Petroleum Watch: What Types of Crude Oil Do California Refineries Process?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.

remaining imports occur by rail.[181] There are no pipelines that bring crude oil into California from out of state.[182]

Figure 2-8: Crude oil imports by transportation type[183]



Crude oil delivered by marine tankers is delivered to onshore storage tanks and subsequently to refineries via pipeline. Most crude oil produced in California is delivered to California refineries by pipeline. Using historical trends, any increases in imported crude above historic levels would result in increased deliveries through the marine ports. This increased activity could require more infrastructure to store and move larger volumes of crude to the refineries in state.

[181] CEC. June 2021. Crude Oil Imports by Transportation Type. Accessed March 16, 2022. *https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source*.
[182] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. *https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf*.
[183] CEC. June 2021. Crude Oil Imports. *https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source*.

California refineries import a variety of crude oils to meet refinery needs. California petroleum refineries are generally designed to process relatively heavy crude relative to other U.S. refineries. In 2018, crude inputs to California refineries had an average American Petroleum Institute (API) gravity of 26.18 and an average sulfur content of 1.64 percent. Processing significantly lighter or heavier crude blends would require significant changes to a refinery.[184] Most crude imported from Alaska and the Middle East is relatively light (API gravity > 30) compared to California crude (API gravity < 20).[185] If California crude production is insufficient to meet the demand at California refineries, then California refineries will need access to a similarly heavy source of crude so that the average API gravity of crude remains within their established operating window. South American crude oil imports into California are the heaviest relative to other regions, and therefore they may be the most likely to replace decreased California crude oil supply.[186]

In summary, the modeling indicates that demand for petroleum will persist due to legacy fleets that will not be replaced until end of life. The modeling also shows what the GHG emissions reductions would be if oil and gas extraction activities were phased down in line with the reduction of in-state petroleum demand. Trend data shows that oil and gas extraction already has been on the decline and will continue to decline. It is possible to anticipate the likely regions and types of crude that would be imported to meet in-state petroleum demand if in-state extraction was fully phased out by 2045. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver crude to in-state refineries. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the production and transport of crude to California might increase elsewhere, resulting in emissions leakage.

As the state continues to reduce demand for petroleum, efforts to protect public health for communities located near oil and gas extraction sites must also continue. In October 2021, Governor Newsom directed action to prevent new oil drilling near communities and

[184] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. *https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf*.
[185] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. *https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf*.
[186] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. *https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf*.

expand health protections.[187,188] In 2022, the Legislature passed, and the governor signed, SB 1137 to protect communities from existing and any new oil and gas extraction activities through 3,200 foot setbacks.

Petroleum Refining

In the Scoping Plan Scenario CARB modeled a phasedown of refining activity in line with petroleum demand. Meeting petroleum demand means sufficient availability of finished fuel (gasoline, diesel, and jet fuel). Crude is processed at in-state refineries to produce finished fuel. In response to stakeholder requests,[189] this evaluation focuses on the Scoping Plan Scenario, but with an evaluation of a complete phasedown of refinery operations in state.

The Scoping Plan Scenario results in California petroleum refining emissions of 4.5 $MMTCO_2e$ in 2045; a reduction of approximately 85 percent relative to 2022 levels, which is in line with the decline in in-state finished fuel demand.[190] Emissions from refining can be reduced further through the application of CCS technology, as shown in Figure 2-9. If in-state refining is phased down to zero and the demand for the finished fuels produced by that refining persists, imported finished fuels may be needed to meet the remaining in-state demand.[191] The current data shows unmet demand for liquid petroleum transportation fuels would most likely be met by marine imports. A CEC report notes, "The only way for California to receive large amounts of crude and refined products is by marine."[192]

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[187] Office of Governor Gavin Newsom. 2021. California Moves to Prevent New Oil Drilling Near Communities, Expand Health Protections. *https://www.gov.ca.gov/2021/10/21/california-moves-to-prevent-new-oil-drilling-near-communities-expand-health-protections-2/?msclkid=6c0da86bc58e11ecb81cf596d4d8a735*.

[188] California Department of Conservation Geologic Energy Management Division. October 2021. Draft Rule for Protection of Communities and Workers from Health and Safety Impacts from Oil and Gas Production Operations. *https://www.conservation.ca.gov/calgem/Pages/Public-Health.aspx?msclkid=45660232cf2511ecb1c56119097e3b0c*.

[189] California Environmental Justice Alliance. October 22, 2021. Comment on 2022 Scoping Plan Update - Scenario Inputs Technical Workshop. *https://www.arb.ca.gov/lists/com-attach/68-sp22-inputs-ws-WzhdPlI5AjACW1Qx.pdf*.

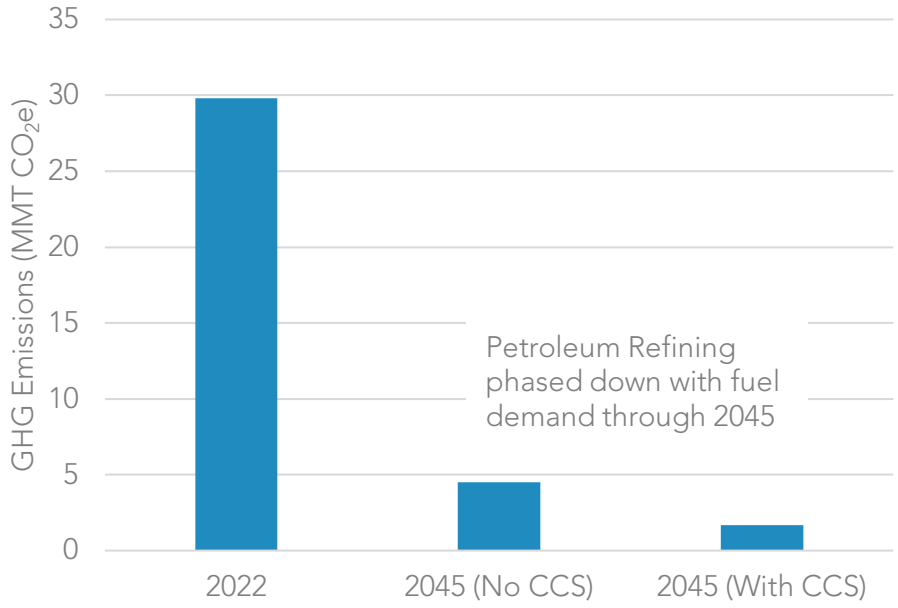
[190] This reduction in demand does not assume any need for ongoing operations to support exports to neighboring states.

[191] If demand assumes an ongoing need to support exports to neighboring states, the residual demand would require a five-fold increase in finished fuel imports.

[192] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. *https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf*.

There are currently no pipelines capable of bringing refined products to the state, and rail imports of refined products have historically made up less than 1 percent of all imports.[193] Significant increases in marine imports would likely require significant reconfiguring, retrofitting, or replacement of crude pipelines and storage tanks at current marine terminals, and possible reconfiguring of existing finished fuel infrastructure to account for changes in volumes and locations of supply points.

Figure 2-9: Petroleum refining sector GHG emissions in 2022 and 2045 (with and without CCS) when activity is phased down with fuel demand



If California's finished fuel demand is not met by continued refining activity in California, the state would need to import finished fuels to meet the ongoing demand. This would likely result in a two- to five-fold increase in the number of finished fuel ship deliveries to marine terminals. Marine tankers delivering refined products are often much smaller than crude oil tankers, so changes in fuel use and emissions cannot be easily estimated from the change in both the type and the number of ship deliveries.[194]

[193] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[194] Personal communication with CEC staff, March 2022; U.S EIA. 2017. *World Oil Transit Chokepoints*. 3. https://www.eia.gov/beta/international/regions-topics.php?RegionTopicID=WOTC.

If refining ceased in California, the rail and marine deliveries currently needed to support both refining processes and the export of waste products, such as petroleum coke, would cease.

In summary, the modeling indicates that demand for petroleum will persist through 2045. The modeling also shows what the GHG emissions reductions would be if refining activities were phased down in line with the reduction in in-state petroleum demand. CCS can further reduce emissions for this sector. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver finished fuel across the state, if in-state refining were fully phased down by 2045. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the refining and transport of finished fuel to California might increase elsewhere, resulting in emissions leakage.

Progress Toward Achieving the Accelerated 2030 Target

The 2017 Scoping Plan laid out a path to achieving the SB 32 target of at least a 40 percent reduction of GHG emissions below 1990 levels by 2030 that focused on reducing emissions in the state and was technologically feasible and cost-effective, reflecting statutory direction. Many of the programs to achieve the 2030 target increased in stringency beginning January 1, 2021. However, the 2030 target must be increased to help achieve the deeper reductions needed to meet the state's statutory carbon neutrality target specified in AB 1279 and Executive Order B-55-18.

Starting in 2020 and extending into 2022, the COVID-19 pandemic impacts reverberated across the globe in a multitude of ways, including the devastating loss of millions of lives. The pandemic also had a significant impact on GHG emissions by virtue of its impact on global economies and lifestyle changes for Californians, with extended work and school disruptions. Thus, assessing our progress toward meeting our SB 32 target is confounded by the unprecedented nature of the pandemic. Nevertheless, an assessment of progress toward the 2030 target is critical, in particular the accelerated 2030 target called for in this Scoping Plan, since achieving the accelerated 2030 target would make the state well positioned to achieve its carbon neutrality goals and bring critical near-term air quality benefits to address historical and ongoing disparities in access to healthy air. Because there is only one year of data available for this decade, the analysis takes a prospective look using projected emissions over the remainder of this decade.

Estimating GHG emissions in 2030 requires projecting the effect of policies or measures that are currently deployed and undergoing implementation. Table 2-4 shows three distinct estimates of GHG emissions in 2030 that were created at different times and used different modeling approaches.

Table 2-4: Estimates of 2030 GHG emissions

Scenario Description	2030 GHG Emissions ($MMTCO_2e$)
2017 Scoping Plan: the projected outcome from implementing policies identified in the 2017 Scoping Plan that was approved by the CARB Board in December 2017.	320
Reference Scenario: the assessment of current trends and expected performance of policies identified in the 2017 Scoping Plan, as of February 2022, using the PATHWAYS model (E3).	305
Reference Scenario (Rhodium): the analysis of projected emissions from 2021 to 2030 from state and federal policies implemented as of July 2022, including the estimated impact of the Inflation Reduction Act and Advanced Clean Cars II using RHG-NEMS and other Rhodium Taking Stock 2022 methods (https://rhg.com/wp-content/uploads/2022/07/Taking-Stock-2022_US-Emissions-Outlook.pdf).	324

These three estimates of 2030 GHG emissions differ, which is expected. The estimates reflect different outcomes of the current and future impact of policies and measures. They also vary due to fundamental differences in the way these models work. For example, PATHWAYS is an economy-wide, scenario-based GHG accounting tool that tracks energy demands and supplies in line with scenario assumptions and is benchmarked to historical values. RHG-NEMS optimizes both the supply and demand sides of the energy system while factoring in consumer constraints and dynamic economic and energy systemwide feedback. Importantly, while these point estimates give the appearance of certainty and accuracy, there is significant uncertainty in future emissions projections that is documented thoroughly in each of the three emissions scenarios described above. No model can predict the future given unforeseen factors such as notable economic swings and implementation delays for programs. However, the range of emissions estimates provides a useful indication of possible outcomes from successful implementation of policies and measures.

An important source of uncertainty is the impact of delayed implementation of policy measures and market actions. The successful rate of deployment of clean technology and fuels—including consumer adoption patterns, economic recovery from the pandemic, and the permitting and build-out of necessary new assets and reuse of existing assets to produce and deliver clean energy—is essential to reach GHG emission reduction targets. Any delays will only increase GHG emissions in 2030.

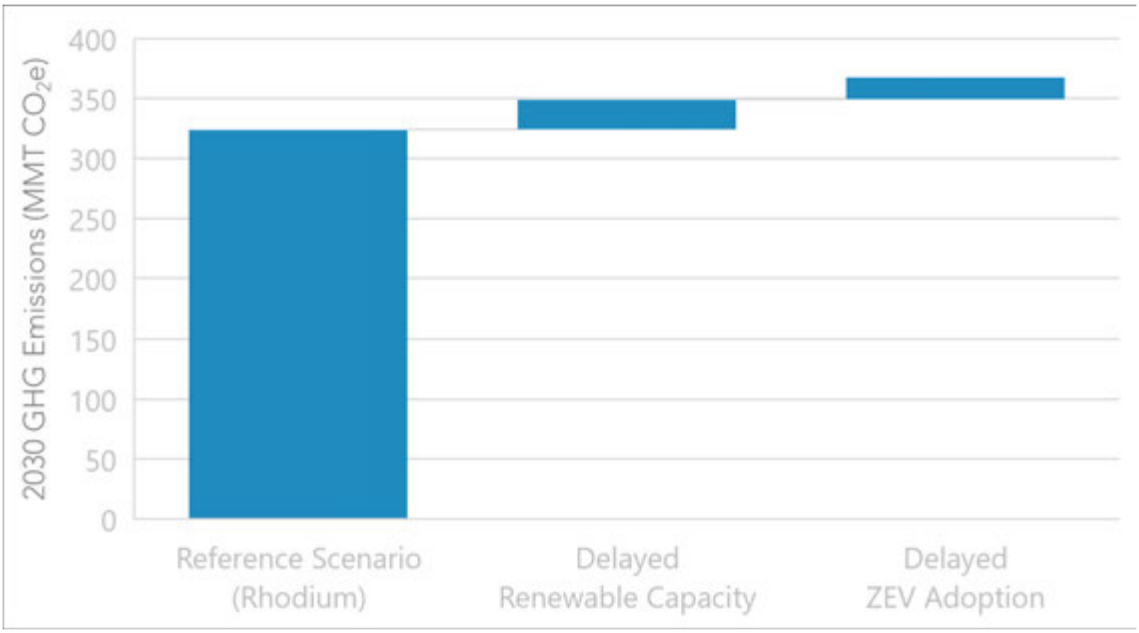
It is important to note that incentives, carbon pricing, and regulations all can result in similar types of responses including, but not limited to:

- Build-out of clean energy and infrastructure
- Deployment of clean technology
- Reduced demand for fossil energy
- Efficiency improvements

As such, the uncertainty analysis discussion focuses on implementation (technology and infrastructure deployment), and not any specific programs or policies. It is successful implementation that must ultimately happen for emissions reductions to be realized.

The uncertainty analysis described in Appendix J (Uncertainty Analysis) quantifies the impact of delayed permitting and building of renewable generation and transmission in the power sector and delayed adoption of ZEVs across all vehicle fleets in the transportation sector. The Reference Scenario (Rhodium) estimates emissions in 2030 to be 324 MMTCO2e. A five-year delay in renewable capacity would increase emissions by 8 percent in 2030 (25 MMTCO2e) relative to the Reference Scenario. If similar delays in clean energy production and deployment occur in other sectors, a larger increase in emissions relative to the reference scenario would be expected, jeopardizing the state's ability to achieve the 2030 target. Similarly, a delay in consumer adoption of zero emission vehicles (LDV, MDV, HDV) would increase emissions by 6 percent in 2030 (19 MMTCO2e) relative to the Reference Scenario. Delays in transitioning to electric equipment and appliances in homes and businesses would also lead to increased emissions in 2030. Figure 2-10 illustrates the impact on projected emissions in 2030 associated with delayed renewable capacity and delayed transportation vehicle electrification.

Figure 2-10: Impact of delayed implementation on 2030 GHG emissions[195]



Appendix J (Uncertainty Analysis) includes additional details on the assumptions and model used for the uncertainty analysis and the risks to achieve the emissions reductions from 2022 to 2030 that are anticipated in the Scoping Plan Reference Scenario. While the analysis focuses on renewable capacity and transportation, the analysis identifies a common set of themes that can impact emissions reductions across economic sectors, including permitting, technology availability, and consumer adoption. The impact of delayed emissions reductions will vary by sector and by the specific policy at risk of delay.

We give these quantitative examples of the impact implementation delays can have on GHG reductions, but almost every economic sector will have the need for permitting to enable at least a 40 percent reduction below 1990 levels. If we consider the increased ambition of the Scoping Plan Scenario, which identifies an accelerated 2030 target, the same types of uncertainty manifest themselves in successful implementation of the Scoping Plan Scenario, with the added need for CCS and CDR and a need to grow other energy sectors such as hydrogen.

[195] The implementation delay scenarios were modeled separately and do not necessarily reflect the combined impact of delayed renewable capacity and transportation vehicle electrification.

Cap-and-Trade Program Update

Since the adoption of the first Scoping Plan in 2008, carbon pricing in the form of a Cap-and-Trade Program has been part of the portfolio to achieve the state's GHG reduction targets, and it will remain critical as we work toward carbon neutrality. This section provides an update on the program and its role in achieving the 2030 target.

The Cap-and-Trade Program first came into effect in 2012, under AB 32, and included declining allowance caps through 2020. In 2017, AB 398[196] was passed by a supermajority in the Legislature and included prescriptive direction on the design of the program from 2021 through 2030. The AB 398 Cap-and-Trade Program came into effect on January 1, 2021, and it included the following changes:

- Doubling of stringency with an annual cap decline of 4 percent per year from 2021–2030
- AB 398 price ceiling
- AB 398 redesigned allowance price containment reserve with two tiers
- AB 398 100 percent leakage assistance factor for industry
- AB 398 lower offset limits: Usage limit cut from 8 percent to 4 percent, and half of offsets must provide direct benefits to California

The reduction in the role of offsets in the program was in recognition of ongoing concerns raised by environmental justice advocates regarding the ability of companies to use offsets for compliance instead of investing in actions on site to reduce GHG emissions that could also potentially reduce criteria or toxic emissions.[197,198] Note that data show the relationship between facility emissions of GHGs and co-pollutants is highly variable by sector and pollutant.[199] Changes to the allowance price containment reserve and the addition of the price ceiling were included to ensure protections against price spikes in the program, while the changes to the leakage assistance factors were to ensure the maximum protection against leakage in the program. The original design of the program included an auction floor price that increases by 5 percent plus inflation each year, and

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[196] Assembly Bill 398 (Garcia, Chapter 135, Stats. of 2017). California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398.

[197] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

[198] The OEHHA report also found that companies that use the most offsets often own the facilities that contribute to local $PM_{2.5}$ exposure. However, there was no causal relationship found to indicate that implementation of the Cap-and-Trade Program was contributing to increases in local air pollution. Also see: CARB. FAQ Cap-and-Trade Program. https://ww2.arb.ca.gov/resources/documents/faq-cap-and-trade-program.

[199] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

that escalation factor is retained in the post-2020 program and is also applied to the allowance price containment reserve and price ceiling. These features, combined with the self-ratcheting mechanism for unsold allowances at auctions,[200] help to ensure the program is able to handle periods of high and low demand for allowances while continuing to ensure a steadily increasing price signal for regulated entities to invest in GHG reduction technologies.

As a result of achieving the 2020 target several years earlier than mandated by law, there are unused allowances in circulation. CARB estimated the amount to be approximately 310 million allowances after the conclusion of the third compliance period (2018–2020).[201] AB 398 had also called for a similar analysis, which was completed in 2018.[202] This bank represents approximately 5 percent of the total number of vintage 2013–2030 allowances issued within the joint market. This bank of allowances can only remain banked if year-over-year the covered emissions are declining by 14 MMT. If the annual decline in actual emissions is less than 14 MMT, regulated entities will need to use the banked allowances to cover their compliance obligations. It is likely that the existing bank of 310 million allowances will be needed over the early part of this decade and will be exhausted by the end of the decade. During the same period, prices for allowances will continue to increase at least 5 percent plus inflation year-over-year, sending a steadily increasing price signal to spur investment in onsite reductions for covered entities.

With the passage of AB 1279, the state has a statutory target to achieve carbon neutrality no later than 2045. This Scoping Plan demonstrates that planning on a longer time frame for the new carbon neutrality target means we must accelerate our near-term ambition for 2030 in order to be on track to achieve our longer-term target. CARB will use the modeling for this Scoping Plan to assess what changes may be warranted to the Cap-and-Trade or other programs to ensure we are on track to achieve an accelerated 2030 target. Since the original adoption of the Cap-and-Trade regulation, the program has been amended eight times through a robust public process. Moreover, then-California Environmental Protection Agency Secretary Jared Blumenfeld testified at a Senate hearing in 2022 that CARB will report back to the Legislature by the end of 2023 on the status of the allowance supply with any suggestions on legislative changes to ensure the number of allowances

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[200] The self-ratcheting mechanism temporarily removes unsold allowances from the market until either sufficient demand manifests for two consecutive auctions and they are incrementally reintroduced at future auctions, or they are permanently removed from general circulation if demand remains low.
[201] CARB. 2022. BR 18-51 Cap-and-Trade Allowance Report. Attachment A. *https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/Allowance%20Report_Reso18_51.pdf*.
[202] CARB. 2018. Staff Report: Initial Statement of Reasons: Proposed Amendments to the Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation. September 4. *https://www.arb.ca.gov/regact/2018/capandtrade18/ct18398.pdf?_ga=2.134288305.1735610122.1664813952-1100516233.1657841496*.

is appropriate to help the state achieve its 2030 target of at least 40% below 1990 levels. As part of that status update, CARB will also provide information on any potential program changes that may be needed to allowance supply to help achieve an accelerated target for 2030 identified in this Scoping Plan as necessary to achieve carbon neutrality no later than 2045. Engaging in this process in 2023 will allow for the consideration of this Scoping Plan, inclusion of additional data points for the second year of operation of the AB 398-designed program (which only came into force in January 2021), and an opportunity to hold public workshops.

It is also worth noting that the COVID-19 pandemic had significant impacts on economic activity in California and elsewhere.[203] Emissions were significantly lower in 2020 due to the impacts of the global pandemic. There is an expectation that emissions will increase as the economy recovers and behaviors continue to shift from the impacts of the ongoing pandemic. As a result, 2020 should be regarded as an outlier in the emissions trends. This scenario of increasing emissions is similar to what happened in the first compliance period for Cap-and-Trade, where the state economy was recovering from the Great Recession and does not correlate to a problem with the structure of this program or other programs that cover emissions related to the manufacturing or transportation sectors. In any assessment of this and other programs, it is essential to consider external factors such as economic activity and availability of zero carbon energy such as hydropower, among others.

To better understand the role of the Cap-and-Trade Program in achieving the 2030 target, Table 2-5 compares the 2030 GHG emissions estimates from the three reference scenarios described in Table 2-4. The 2017 Scoping Plan projection is from the PATHWAYS model for the Scoping Plan Scenario approved by the Board in late 2017. It excludes the contribution of the Cap-and-Trade Program, without any consideration of uncertainty factors (i.e., a characterization of the uncertainty that a given GHG reduction measure included in the 2017 Scoping Plan will actually achieve the GHG reductions it is projected to deliver). The Reference Scenario represents what GHG emissions would look like if we did nothing beyond the existing policies that are required and already in place to achieve the 2030 target; this scenario is based on the recent PATHWAYS modeling, excluding the contribution of the Cap-and-Trade Program, and without any consideration of uncertainty factors. It indicates that GHG emissions will be lower over this decade than originally projected when the 2017 Scoping Plan was approved. The

[203] CARB. November 4, 2021. Mandatory Greenhouse Gas Reporting - 2020 Emissions Year Frequently Asked Questions. *https://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/2020mrrfaqs.pdf?_ga=2.264251343.1760432228.1650736660-1644197524.1577749754*.

Reference Scenario (Rhodium) which also does not include uncertainty bounds, is the modeling used for the uncertainty analysis above.

Importantly, PATHWAYS is not able to explicitly model a carbon pricing policy, and therefore the Cap-and-Trade Program is not represented in the 2017 Scoping Plan or the Reference Scenario. Carbon pricing is included in RHG-NEMS, which reflects state and federal policies included in the U.S. Energy Information Administration (EIA) Annual Energy Outlook 2022 and the National Energy Systems Model (NEMS), which is the basis for RHG-NEMS.[204]

As detailed in EIA's documentation, California's Cap-and-Trade Program is represented through increased energy prices, which flow across economic sectors.[205] However, many of the emissions covered by the California Cap-and-Trade Program are not energy- and fuel-related emissions. Given that, the energy systems model RHG-NEMS was used to model the impact of California Cap-and-Trade on the energy system. However, RHG-NEMS does not explicitly model the entire program, which includes non-energy related emissions from the industrial, agricultural, waste, and transportation sectors.

[204] U.S. EIA. 2022. *Summary of Legislation and Regulations Included in the Annual Energy Outlook 2022.* March. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/summary.pdf*.
[205] U.S. EIA. 2022. Electricity Market Module. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/electricity.pdf*.

Table 2-5: Comparison of 2017 Scoping Plan and two Reference Scenarios

	2030 GHG Emissions ($MMTCO_2e$) (2017 Scoping Plan)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario-Rhodium)
Reference Scenarios	320	305	324
Gap to Accelerated 2030 Target under the Scoping Plan Scenario (226)[206]	94	79	98

Under the Scoping Plan Scenario, in 2030 California emissions are anticipated to be 48% below 1990 levels. This represents an acceleration of the current SB 32 target of a 40% reduction below 1990 levels. Table 2-5 includes the gap between the different reference scenarios and the accelerated 2030 target achieved under the Scoping Plan Scenario. It also shows that depending on the modeling, there are a range of potential emissions levels in 2030 prior to accounting for the full impact of the Cap-and-Trade Program on emissions. That range is from 305 to 324 $MMTCO_2e$ in 2030. That represents a 19 $MMTCO_2e$ spread, or about 8.4 percent of the accelerated 2030 target of 226 $MMTCO_2e$. Importantly, none of these scenarios includes all of the actions identified in the Scoping Plan Scenario for this Scoping Plan; many of those actions, such as SB 596, CCS, and a more stringent LCFS program, will only begin to happen in this decade, and their contributions toward meeting the accelerated 2030 target are therefore not included in the reference scenarios. The actual emissions for the remainder of this decade will therefore likely be lower than in each of the scenarios in Table 2-5 once policies and regulations are in place to support an accelerated 2030 target. However, the degree of this difference between actual and projected emissions will differ across the modeled reference scenarios.

[206] Table 3 from the 2017 Scoping Plan included a range of 34 to 79 $MMTCO_2e$ for reductions needed from the Cap-and-Trade Program to achieve a 2030 target of 40 percent below 1990 levels.

Regardless of the uncertainty and differences in the models, it is clear additional GHG reductions must happen over this decade to achieve an accelerated 2030 target. This will require an evaluation of all major programs to assess the need to increase their stringency between now and 2030. As the actual reductions from non-Cap-and-Trade Program measures increase, California will be less reliant on the Cap-and-Trade Program to "fill the gap" to meet an accelerated 2030 reduction target. For example, CARB is developing a proposal to increase the stringency of the LCFS program for 2030, the recently adopted Advanced Clean Cars ll regulation is more stringent than modeled for the 2030 40 percent target in the 2017 Scoping Plan, and SB 596 requires specific reductions in the cement sector over this decade and beyond. However, we also know we are not on track to achieve the VMT reduction called for in the 2017 Scoping Plan and will need to double down to achieve the even more ambitious target called for in the Scoping Plan Scenario. Also, we will need additional actions over the coming years to reduce short-lived climate pollutants to meet the emission reductions called for in SB 1383.

Collectively, any additional legislation or prescriptive policies for sectors, delays in successful implementation of non-Cap-and-Trade programs and policies, increases in incentive program funding, and delays in economic recovery from the pandemic will continue to affect the role the Cap-and-Trade Program will need to play over this decade to meet the state's GHG reduction obligations. In summary, the Cap-and-Trade Program must continue to be able to scale across a range of possibilities. With passage of AB 1279 and the need to accelerate the 2030 target, CARB will initiate a public process to utilize the modeling results from this Scoping Plan, specifically the Scoping Plan Scenario, to evaluate and potentially propose changes to the design of the Program, including the annual caps. This process will ensure that the Program supports an increased ambition for 2030 while retaining the ability to scale as other factors, such as changing economic conditions and implementation of non Cap-and-Trade programs, impact the actual emissions at the sources covered by the Program. Any changes to the Program must continue to support a well-designed system that continues to send a steadily increasing price signal, minimizes for leakage, reduces emissions in the covered sectors toward the state's targets, is cost-effective and technologically feasible, and avoids energy rate spikes. Importantly, the Program should support air quality benefits, especially in overly burdened communities, and not exacerbate existing air quality disparities.

Chapter 3: Economic and Health Evaluations

This chapter provides two approaches for quantifying the economic and health outcomes of the Scoping Plan Scenario. One approach is to consider the combined impact of all measures[207] in a scenario. The other approach is required by AB 197, where each measure within a scenario is evaluated independently. In addition to these two evaluation approaches, this chapter also includes a discussion of the Public Health implications for the Scoping Plan Scenario, an overview of the Climate Vulnerability Metric, and the Environmental Analysis conducted in accord with the California Environmental Quality Act (CEQA).

It is important to note that all of the analyses in this chapter use a variety of data sources, but because the modeling is economy-wide at the state level, none of them produce community specific detail outputs. The AB 32 GHG Inventory Sector analysis relies on PATHWAYS data at the state level that is proportionally applied across all regions of the state to translate changes in state level fuel combustion to local level changes. The NWL analysis similarly utilizes a variety of data sources and a suite of models that produce data that are scaled up to the statewide level. All of the models, except the Wildland Urban Interface (WUI) defensible space model, which is conducted at the county level, create aspatial projections that are not applicable at the community level.

Economic Analysis

As part of the process to develop this Scoping Plan, alternative scenarios that transition energy needs away from fossil fuels and achieve carbon neutrality no later than 2045 were developed. Alternative scenarios that assess the impact of different land management strategies on carbon stocks in NWL were also developed. These alternatives are described in Appendix C (AB 197 Measure Analysis). The following sections describe the Scoping Plan Scenario in terms of direct cost, the economy, employment, and health outcomes.[208]

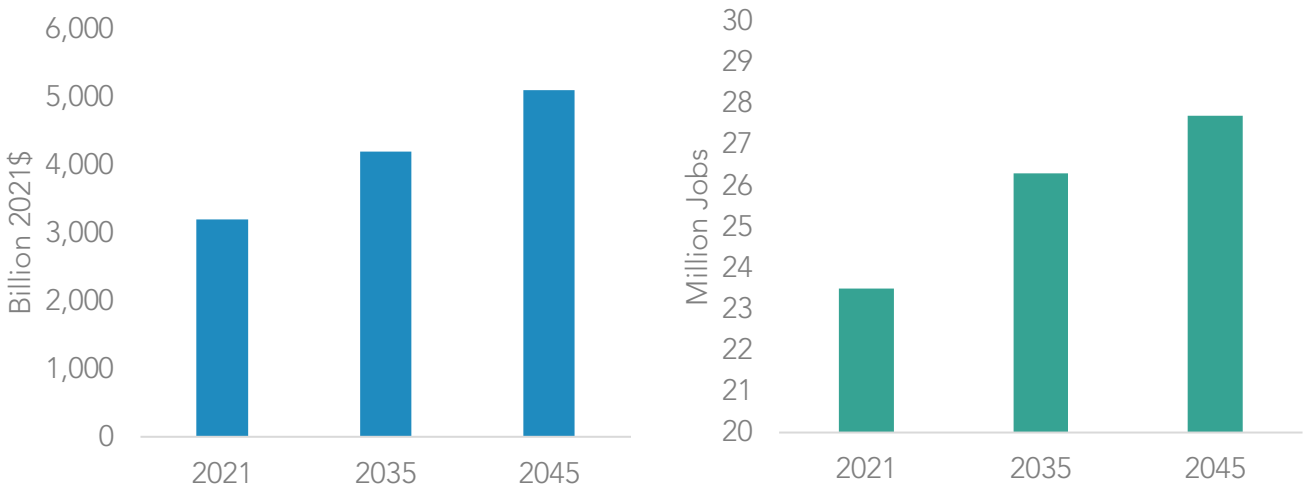
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[207] AB 197 calls for the evaluation of "measures." This Scoping Plan treats each action and its variants on stringency as measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative and the Scoping Plan Scenario. The modeling assumptions for the Scoping Plan Scenario are summarized in Table 2-1.

[208] For the Draft 2022 Scoping Plan Update, achieving carbon neutrality in 2035 and 2045 was evaluated. The AB 32 GHG Inventory sector direct cost, the economy, employment, and health outcomes were assessed in those years. Similarly, the Scoping Plan Scenario assessments that are presented in this chapter were made for years 2035 and 2045.

The California economy is growing, and it is projected to continue to grow about 2 percent each year, from $3.2 trillion in 2021 to $5.1 trillion in 2045, as shown in Figure 3-1. Similarly, employment in California is anticipated to grow 0.7 percent per year, from 23.5 million jobs in 2021 to 27.7 million jobs in 2045. It is in this context, termed the *Reference Scenario,* that CARB evaluates the Scoping Plan Scenario in terms of its impact on economic growth and employment. The projections shown in Figure 3-1 were produced by CARB to evaluate the incremental impact of regulations.

Figure 3-1: Projected California gross state product (left) and employment growth (right) from 2021 to 2035 and 2045



Source: California Air Resources Board

Transitioning away from fossil fuels to alternatives and increasing action on NWL will affect employment opportunities, household spending, businesses, and other economic aspects of our lives. Sectors expected to see growth include renewable electricity and hydrogen production, while other sectors may shrink. The deployment of clean technology may require higher upfront costs for things like heat pumps and induction stoves, but those could be offset by energy efficiency savings. Employment and economic development in NWL-related industries and sectors are expected to increase as land management actions increase, especially for the Forestry sector (in which a significant increase is called for under the Scoping Plan Scenario). The net impact of these actions on employment and jobs is presented in this chapter.

Estimated Direct Costs

One key metric is the direct cost, or net investment, reflecting any savings that result from actions. Similar approaches were used to estimate direct costs for the AB 32 GHG Inventory sectors and for the NWL, as described in this section.

AB 32 GHG Inventory Sectors

Transitioning away from fossil fuels requires investment in new equipment and infrastructure throughout the economy. It involves developing the capacity to produce fuels and electricity from renewable sources rather than producing fossil energy. This transition also takes time. One approach is to eliminate combustion of fossil fuels by replacing all equipment in a specified year. Another approach is to establish a future point at which all sales of new equipment rely on alternative energy sources and allow the transition to occur over time as equipment is replaced upon its end of life.

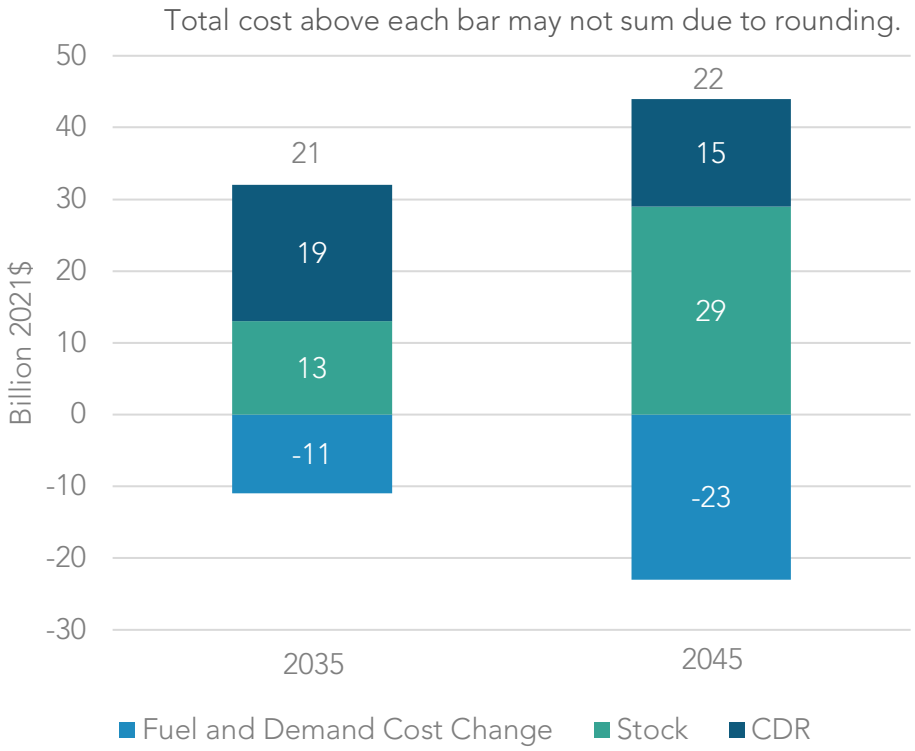
To evaluate the investment required through 2045, the PATHWAYS model was used to represent equipment stock and its turnover to non-fossil fuel alternatives over time. The annualized, incremental cost of infrastructure in excess of the annualized cost of the Reference Scenario[209] was computed for each year from 2022 through 2045. These costs were computed by first taking the absolute cost in each year—which includes both new equipment investment and also expenditures on energy, operations, and maintenance in each year—and then levelizing the costs (in the same way car or house payments are annualized or spread out over time) to arrive at an annualized cost. Fuel savings, and resulting cost savings, associated with changing energy demand—from gasoline to electricity for vehicles, for example—are included as a result of this methodology. Carbon dioxide removal includes DAC technology powered primarily by off-grid solar, BECCS to produce hydrogen or other fuels, and NWL sequestration, as discussed in Chapter 2.[210]

Figure 3-2 shows the stock investment cost, fuel/efficiency savings, and CDR cost. The Scoping Plan Scenario allows end-of-life transition of equipment. The cost of investing in new equipment is partially offset by savings associated with efficiency gains and reduced demand for fuels like gasoline. This is particularly relevant in the transportation sector, which leads to the majority of savings in 2045 in the Scoping Plan Scenario, which models near complete electrification of transport relying only on end-of-life replacement of vehicles. Appendix H (AB 32 GHG Inventory Sector Modeling) includes additional detail on direct costs in each sector and how costs change over time.

[209] The Reference Scenario described in Chapter 2 and in Appendix H (AB 32 GHG Inventory Sector Modeling) was the basis for the direct cost comparison.

[210] The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero-carbon options consistent with the carbon neutrality targets in this Scoping Plan. The economic analysis associated the investment in DAC with the solar industry for consistency with the carbon neutrality targets.

Figure 3-2: Cost and savings relative to the growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



Natural and Working Lands

For NWL, the direct costs of each management strategy were estimated using available academic literature, monitoring and reporting data, survey data, and cost data from existing subsidy programs on the per acre cost of implementing the management strategy. These cost data, in combination with the acreage of each management strategy under the scenarios, provided estimates of the overall direct cost to either the government or the private sector. The direct costs are independent of the policy lever used to implement the action and do not include many important benefits and externalities of the actions. They are assumed to be constant for each scenario and into the future. Avoided or secondary costs, such as those from reductions in wildfire suppression expenses, are not included. Appendix I (NWL Technical Support Document) includes additional direct cost details.

Table 3-1 includes the direct cost estimates for the Scoping Plan Scenario compared to the Reference Scenario.[211] Direct costs for the NWL sector are expected to be significant due to the ambitious level of action for each land type.

Table 3-1: Cost and savings relative to a growing California economy for the Scoping Plan Scenario (NWL)

Measure	Scoping Plan Scenario: Average Direct Annual Cost, 2025–2045 (millions $/year)
Forests / Shrublands / Grasslands	1,780
Annual Croplands	284
Perennial Croplands	4
Urban Forest	4,230
Wildland Urban Interface (WUI)	114
Wetlands	28
Sparsely Vegetated Lands	4
Totals	6,460
Note: Table values may not add to total due to rounding.	

CARB estimates that all jurisdictions, including private landowners, currently spend approximately $4 billion dollars annually on planting, maintenance, sidewalk repair, tree removal, and other expenses related to urban forests, and that reaching the theoretical maximum tree cover would require increasing that spending by a factor of 20. The cost of the Scoping Plan Scenario is predominantly a mix of urban forests and forests, shrubland, and grasslands spending.

[211] The Reference Scenario described in Chapter 2 and in Appendix I (NWL Technical Support Document) was the basis for the direct cost comparison.

Economy and Employment

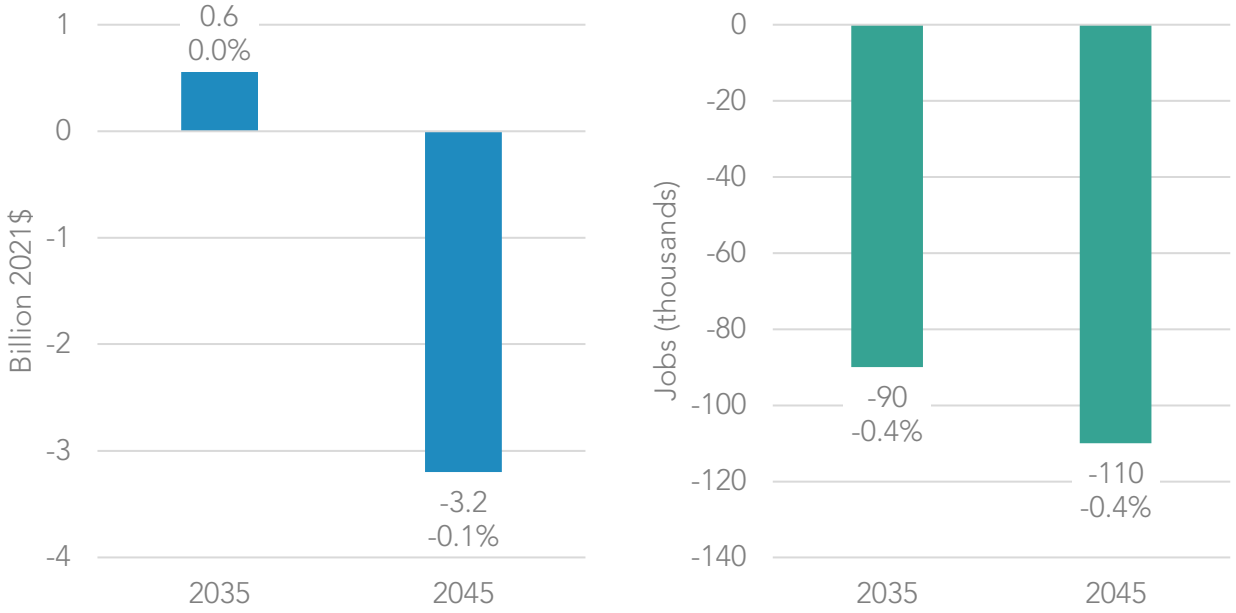
Two different models were used to estimate the overall impact that investing in a transition away from fossil fuels and in our NWL may have on the growing California economy. The transition away from fossil fuels was evaluated using the IMPLAN economic analysis model. The NWL investments were evaluated using the REMI PI+ economic model. These models provide similar outputs relative to the same economic and employment forecasts used to develop a Reference Scenario for use in each model.

AB 32 GHG Inventory Sectors

To estimate the overall impact that investing in a transition away from fossil fuels may have on the California economy, CARB used the IMPLAN model. Additional detail regarding the model, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). The IMPLAN model is a multisector representation of private industries in the U.S. economy that maps economic relationships across industries, households, and governments. This model translates direct costs and savings associated with transitioning away from fossil fuels with indirect effects such as wages, purchases of goods and services, business tax impacts, and supply chain effects. In addition, the induced effects of household purchases, local and import purchases, wages paid, and household tax impacts are estimated. This comprehensive assessment of the interactions between capital investment in fossil fuel alternatives and household purchases provides an indication of the response of the California economy to the Scoping Plan Scenario.

The Scoping Plan Scenario results in a small impact on the Gross State Product (GSP) and employment relative to the Reference Scenario, as shown in Figure 3-3. Economic growth is largely unaffected by the Scoping Plan Scenario in 2035 and slowed by 0.1 percent in 2045. Employment growth is also slowed a small amount, 0.4 percent in 2035 and in 2045, and employment still grows. Assuming annual growth rates of 0.7 percent means there would be more than 193,000 additional jobs in 2045.

Figure 3-3: Gross state product (left) and employment (right) relative to a growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



California households will see increased costs from the purchase of new capital stock and savings from reduced spending on fuel, as shown in Figure 3-2. Households also will face increased costs associated with CDR, costs associated with energy efficiency measures, and commercial stock purchases—all of which are assumed to be passed directly to consumers. The impact to California households, however, is not limited to these direct costs, as changes in relative prices, employment, and wages can affect household well-being. Personal income, which captures the direct, indirect, and induced impacts, is a metric commonly used to evaluate the impact of policies on households.

Personal income in California is projected to grow from $2.7 trillion in 2021 to $3.6 trillion in 2035 and $4.4 trillion in 2045. Household projections are based on California Department of Finance population projections, which estimate the state's population to grow an average of 0.3 percent each year from 2021 to 2045.[212] California households are projected to increase from 13.3 million in 2020 to 14.6 million in 2035 and 15.0 million in 2045.

[212] California Department of Finance. Population Projections (Baseline 2019). *https://dof.ca.gov/forecasting/demographics/projections/.*

While the transition away from combustion of fossil fuels will improve air quality for all Californians (and even, more so in overly burdened communities), the economic impacts of the Scoping Plan Scenario are unlikely to be equal among Californians. Table 3-2 presents the change in income by household income group relative to the Reference Scenario in 2035 and 2045. While in 2035 there is a net decrease in personal income of $600 million, total income for households that make less than $100,000 per year is estimated to decline by $4.1 billion dollars, and the total income for households that make more than $100,000 per year will increase by $3.5 billion under the Scoping Plan Scenario. In 2045, although there is no net change in personal income across all California households, results vary by income level. Total income for households that make less than $100,000 per year are estimated to decline by $5.3 billion dollars, while the total income for households that make more than $100,000 per year will increase by $5.3 billion under the Scoping Plan Scenario.

Table 3-2: Income Impacts by California household income group in 2035 and 2045 for the Scoping Plan Scenario (AB 32 GHG Inventory Sectors)

Household Income Group ($2021)	Percentage of 2021 California Households[213]	Change in Income (Billion $2021)	
		2035	2045
Less than $50,000	30	-2.9	-3.9
$50,000 to $100,000	27	-1.2	-1.4
$100,000 to $200,000	28	2.5	4.0
More than $200,000	15	1.0	1.3
Total	100	-0.6	0.0

[213] U.S. Census Bureau. 2021. Household Income. California. https://data.census.gov/cedsci/table?q=california%20income.

In addition to income level, there is likely to be an impact to California personal income that varies based on race/ethnicity.[214] Table 3-3 shows the percentage of households within each income group based on eight race/ethnicity categories identified in the American Community Survey 2021. As shown in Table 3-2, households in lower income groups are anticipated to see negative impacts, while households in higher income groups are anticipated to see positive impacts from the Scoping Plan Scenario in both 2035 and 2045. Because more than 60% of households in the race/ethnicity categories of Hispanic, Black alone, Native Hawaiian (HI) or Pacific Islander, American Indian or Alaskan Native, Other, and Two or More make less than $100,000 per year, these populations generally are likely to experience reduced income. White and Asian households will generally experience both increased and decreased income because these households are distributed more evenly across all four income groups.

The state recognizes the need to ensure that accessibility to clean technology and energy do not further exacerbate health and opportunity gaps for low-income households and communities of color. The Climate Change Investments program exceeds the statutory minimums to invest in projects to benefit disadvantaged communities.[215] Utilities implement programs for reduced energy bills for qualifying low-income customers.[216] There are also resources for waste and water bills that leverage federal funds.[217] CARB also coordinated with the CPUC to ensure that the Climate Credit[218] funded from the sale of Cap-and-Trade allowances provided to utilities on behalf of ratepayers is credited equally to households and not based on how much energy is used. These are just a few examples of how the state is designing and implementing programs to avoid increasing existing disparities. The state must continue to find ways to relieve economic burdens on low-income households.

[214] The number of households in each bracket and the race/ethnicity categories are from American Community Survey 2021 results. Population changes through 2035 and 2045 are not forecast. U.S. Census Bureau. 2021. Household Income. California. *https://data.census.gov/cedsci/table?q=california%20income*.
[215] CARB. Priority Populations — California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.
[216] CPUC. CARE/FERA Program. *https://www.cpuc.ca.gov/lowincomerates/*.
[217] California Department of Community Services and Development. Low Income Household Water Assistance Program. *https:/www.csd.ca.gov/lihwap*.
[218] CPUC. California Climate Credit - FAQ. *https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program/california-climate-credit/california-climate-credit---faq*.

Table 3-3: Percentage of households in each race/ethnicity category by household income group

Household Income Group ($2021)	Households in Income Group (%)							
	White Not Hispanic	Hispanic	Black Alone	Asian Alone	Native HI or Pacific Islander	American Indian or Alaskan Native	Other	Two or More
Less than $50,000	26	35	45	25	30	35	37	32
$50,000 to $100,000	25	32	27	21	31	33	33	30
$100,000 to $200,000	29	25	21	30	30	26	24	27
More than $200,000	19	7	7	24	9	7	5	11

Natural and Working Lands

The macroeconomic impact of the NWL scenario was evaluated separately in the REMI PI+ model. For the Scoping Plan Scenario, the macroeconomic impact was modeled by assuming that economic activity in the relevant industries grows in proportion to the proposed implementation spending in that industry. All funds for implementing the actions were assumed to be sourced from within the state. For urban forests, the funds were modeled as being sourced from a combination of state government and private property owners in proportion to the current estimated private/public spending ratio. For all other actions, funds were assumed to be sourced from the state government. In each modeled scenario, government spending and income to property owners were reduced relative to the Reference Scenario in proportion to the annual costs of implementation. None of the proposed spending was modeled as being sourced from increased taxes. Additional details on the methodology for evaluating macroeconomic impacts are in Appendix I (NWL Technical Support Document).

While the macroeconomic model does count the increased economic activity in the affected industries as part of GSP, it does not quantify many of the important economic, health, and environmental benefits that would occur if these actions were implemented. While these benefits—like the reduced use of pesticides, value of urban trees, and increased recreational opportunities—would be very significant, they are outside the scope of the macroeconomic model.

The macroeconomic model also makes projections about the total level of employment in the state. The model forecasts that the Scoping Plan Scenario, which greatly increases the level of NWL management actions, channels economic activity toward related industries and would lead to a slight increase in total employment. (Table 3-4). While the model does aim to accurately represent many labor market dynamics, including adjustments of wages and migration rates, it does not account for many costs that might be associated with dramatically scaling up employment in a particular industry, such as the cost of job training.

Table 3-4: Gross state product and employment relative to a growing California economy for the Scoping Plan Scenario in 2035 / 2045 (NWL)

	Scoping Plan Scenario (%)
Gross State Product	0.00 / 0.01
Employment	0.12 / 0.10
Personal Income	-0.04 / -0.04
Personal Income per Capita	-0.04 / -0.14

Health Analysis

Air quality is affected by pollutant emissions from various processes associated with energy systems, including the combustion of fossil fuels, as well as the combustion of vegetation biomass from NWL during wildfires. Pollutants that are important contributors to degraded air quality in California include nitrogen oxides (NO_x), particulate matter (PM), reactive organic gases (ROG), and others. Further, in the atmosphere these pollutants are transported away from the locations of the emissions by wind and other phenomena, and undergo chemical reactions that result in the formation of new pollutants such as ground-level ozone and fine particulate matter ($PM_{2.5}$). Both primary (emitted) and secondary (formed) pollutants are important from a public health standpoint and contribute to the incidence of air pollution-related mortality and disease within California populations. Measures focused on GHGs do not incorporate specific targets to reduce emissions of $PM_{2.5}$ or air toxics like benzene. These co-pollutants, which are emitted from many of the same pollution sources as GHGs, affect local air quality and pose known risks to public health, such as the risk of asthma and cardiovascular disease. Generally, for stationary sources, certain harmful pollutants are regulated via local rules and regulations that are reflected in permits for stationary sources and are enforced by local air districts, with CARB also regulating air toxics contaminants from stationary sources with the air districts.

AB 32 GHG Inventory Sectors

To assess health impacts for the AB 32 GHG Inventory sectors, an integrated modeling approach was used to quantify and value the air pollution-related public health benefits of the Scoping Plan Scenario relative to the Reference Scenario. Additional details about the models, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). Using output from the PATHWAYS model, projections of pollutant emissions to 2045 were developed for stationary, area, and mobile source emissions using a detailed base year CARB pollutant emissions inventory. Further, the emissions are processed, including for where and when they occur in California, using the Sparse Matrix Operator Kernels Emissions (SMOKE) model. For example, on-road vehicle emissions were allocated along existing roadways, and refining emissions were assigned to the locations of existing refineries. It should be noted that the emissions projections represent statewide average reductions associated with high-level assumptions about alternative fuels and technologies. For example, emissions occurring from refineries to produce liquid fuels are reduced in line with petroleum demand. This reduction is applied equally to all refineries in the Scoping Plan Scenario and does not specify individual facility responses to changing demand. Similarly, the Scoping Plan Scenario does not specify which refineries transition to biofuel production or where new electricity generation facilities are built.

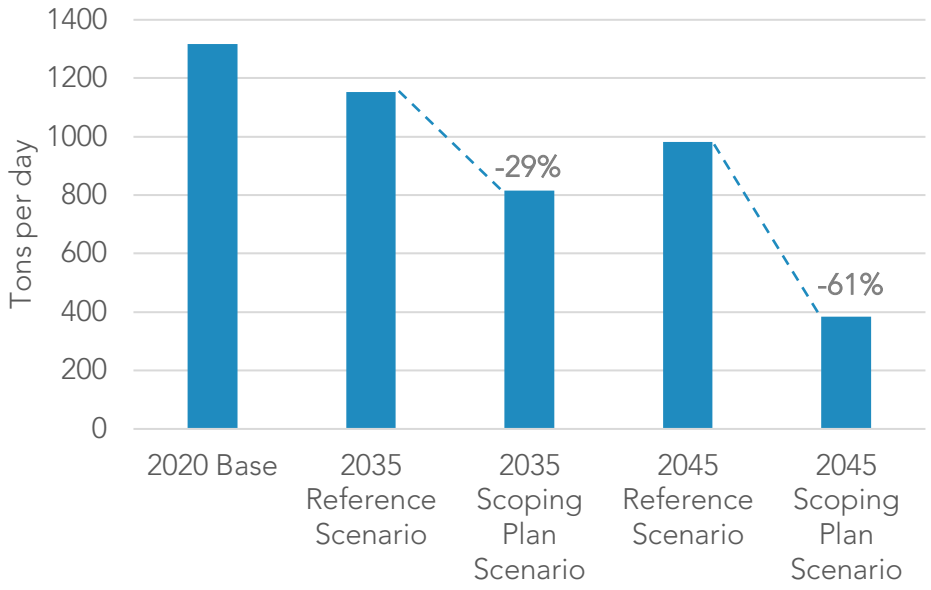
Next, emission changes were translated into impacts on atmospheric pollution levels, including ground-level ozone and $PM_{2.5}$, via an advanced photochemical air quality model called the Community Multiscale Air Quality (CMAQ) model, which accounts for atmospheric chemistry and transport. A comprehensive assessment of how pollutant concentrations are impacted throughout the year was achieved by simulating all months in 2035 and 2045 for the Scoping Plan Scenario.[219] Health benefits were estimated using the U.S. EPA's environmental Benefits Mapping and Analysis Program (BenMAP) model to translate pollutant changes into avoided incidence of mortality, hospital admissions, emergency room visits, and other outcomes as a result of reduced exposure to ozone and $PM_{2.5}$. These outcomes are associated with an economic value in order to aggregate health impacts.

The Scoping Plan Scenario shows a substantial reduction in pollutant emissions relative to the Reference Scenario, including NO_x, $PM_{2.5}$, and ROG. Reductions in NO_x are shown in Figure 3-4. Even under a business-as-usual trajectory, emissions are reduced from present levels by 26 percent in 2045 in the Reference Scenario, demonstrating the impact of current regulations and trends in energy sectors. The Scoping Plan Scenario further reduces NO_x

[219] This annual approach differs from the episodic modeling approach applied to the Proposed Scenario and Alternatives in the Draft 2022 Scoping Plan Update. Appendix H (AB 32 GHG Inventory Sector Modeling) describes both approaches.

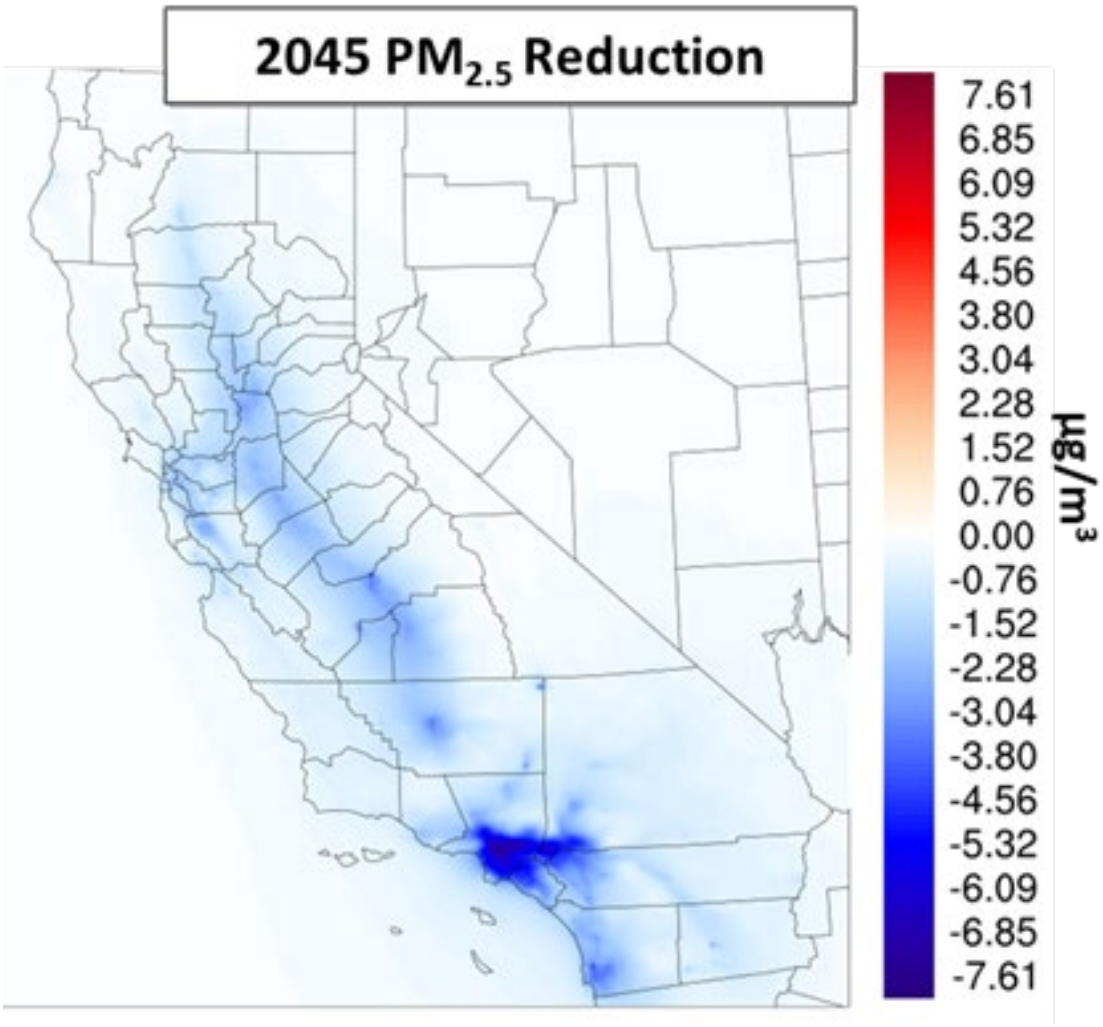
emissions from the Reference Scenario by 29% in 2035 and 61% in 2045. Emission reductions occur throughout the state with particular prominence in urban areas, including the South Coast Air Basin, due to the large presence and activity of emission sources. Appendix H (AB 32 GHG Inventory Sector Modeling) contains additional information about the pollutant emissions modeling and results.

Figure 3-4: Illustration of NOx emission reductions from current levels for the Reference Scenario and the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



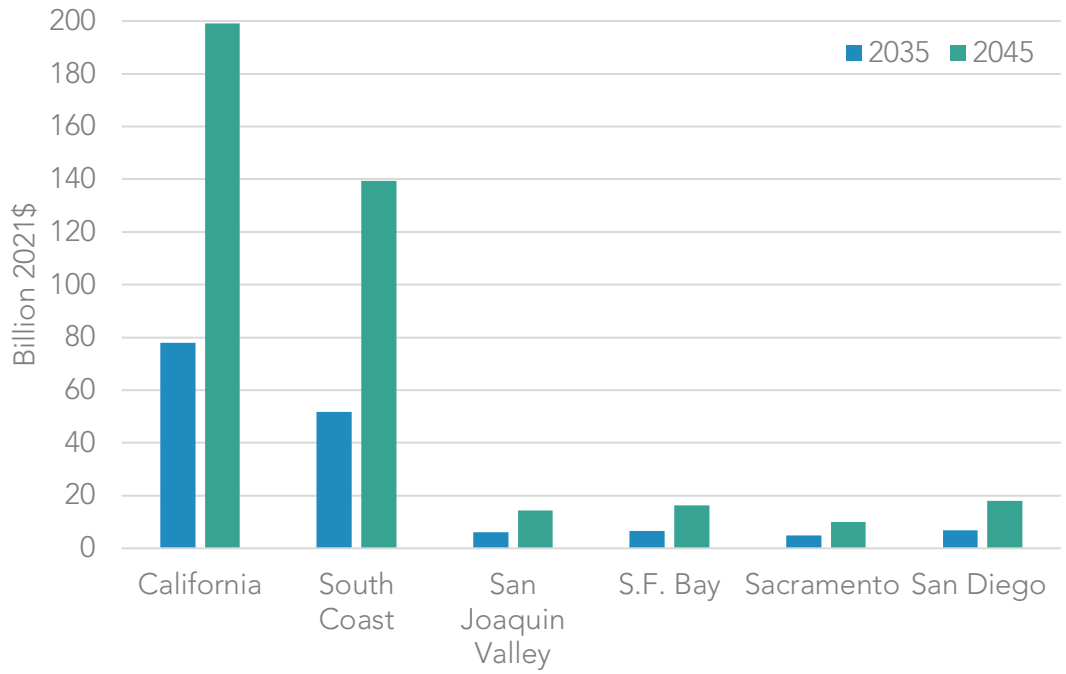
The emission reductions achieve important improvements in air quality throughout California, including reductions in the levels of ozone and $PM_{2.5}$. Reductions in annual $PM_{2.5}$ levels are shown in Figure 3-5. The greatest reductions are evident in Southern California, the San Joaquin Valley, the San Francisco Bay area, and the Greater Sacramento area due to the large presence and activity of emission sources, meteorology, topography, and others. To highlight the extent of the air quality improvements: reductions reach nearly 8 micrograms per cubic meter ($\mu g/m^3$) in 2045 and lead to 76% fewer exceedances of the health-based National Ambient Air Quality $PM_{2.5}$ standard of 12 $\mu g/m^3$. Similarly, ozone improvements reach 19 parts per billion (ppb) and yield 62% fewer exceedance events. Furthermore, the locations of improvements carry important implications for human health as these areas support large urban populations and generally experience the most degraded ozone and $PM_{2.5}$ pollution. Appendix H (AB 32 GHG Inventory Sector Modeling) provides details regarding the atmospheric modeling and results, including differences in ozone and $PM_{2.5}$.

Figure 3-5: Difference in annual average $PM_{2.5}$ ($\mu g/m^3$) in the Scoping Plan scenario relative to the Reference scenario in 2045 (AB 32 GHG Inventory sectors)



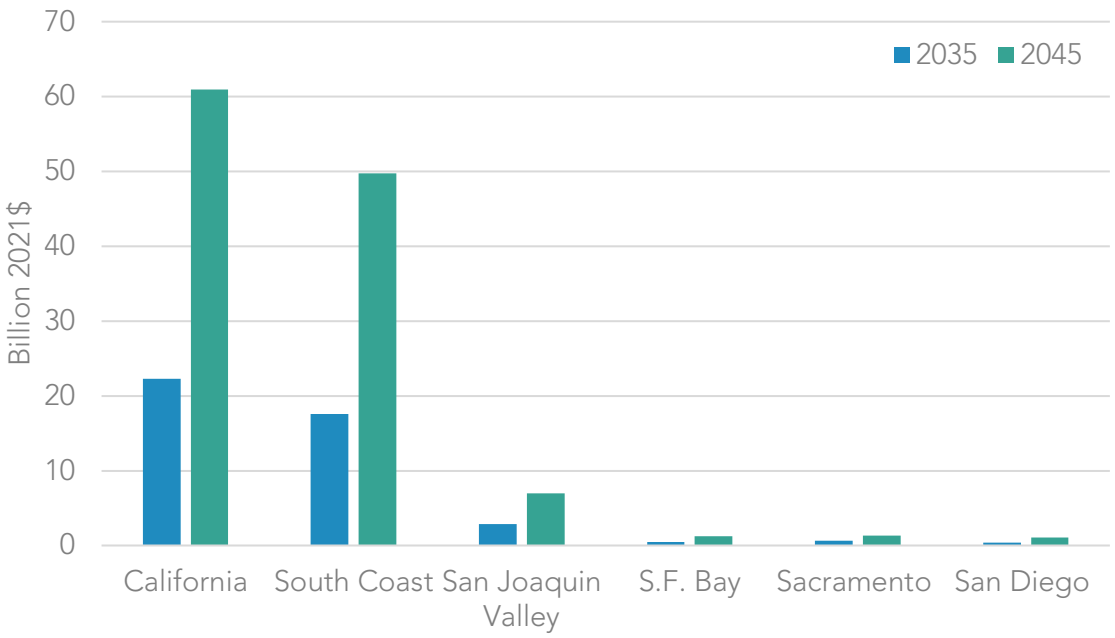
Notable health benefits representing the economic value of the avoided incidence of health effects are associated with the Scoping Plan Scenario. In total, the benefits reach $78 billion in 2035 and $199 billion in 2045, as shown in Figure 3-6. Populations in Southern California benefit the most due to preexisting air quality challenges, significant emission sources and activity, and the presence of a large, dense urban population. Additional details regarding the health impact assessment are provided in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-6: Total health benefits estimated from air quality improvements in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



Furthermore, these benefits accrue within socially and economically disadvantaged communities identified by CalEnviroScreen, where they are most needed. Total health benefits within census tracts identified as disadvantaged communities using CalEnviroScreen 4.0 reach $22 billion in 2035 and $61 billion in 2045, as shown in Figure 3-7. Similarly to the statewide health benefits, the largest share of benefits occurs within disadvantaged communities in Southern California. Additional information on the health benefits within disadvantaged communities can be found in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-7: Disadvantaged community health benefits relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

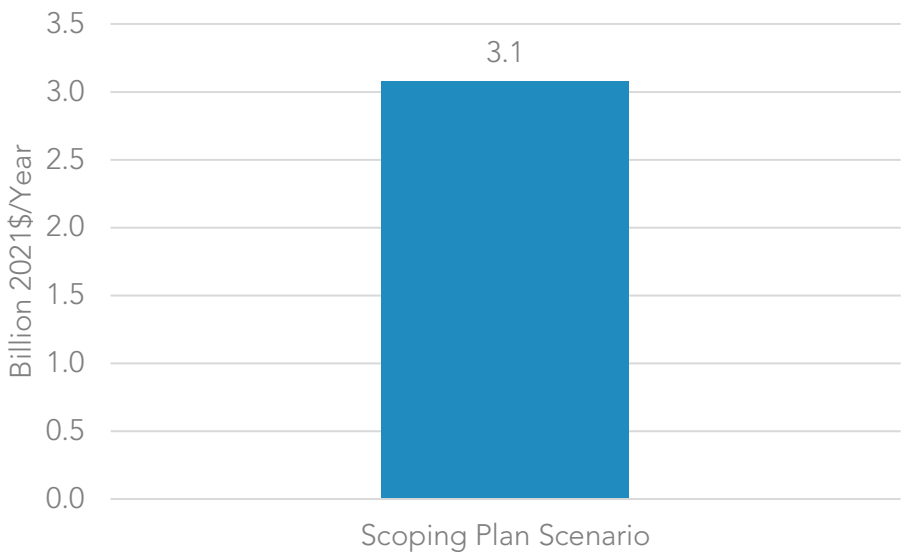


Natural and Working Lands

For NWL, health benefits were evaluated based on projected $PM_{2.5}$ wildfire emissions on forests, shrublands, and grasslands, discussed in the AB 197 Measure Analysis section of the chapter that follows.[220] The health endpoints for the Scoping Plan Scenario and in Appendix I (NWL Technical Support Document) for the alternative scenarios were the basis for the estimated health benefits shown in Figure 3-8. Health benefits were derived from the preliminary University of California, Los Angeles (UCLA) study that estimated annual health impacts and associated costs from California's wildfires from 2008–2018. Additional details are included in Appendix I (NWL Technical Support Document). These costs were applied to the health endpoints discussed in the AB 197 Measure Analysis section of the chapter.

[220] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 3-8: Total average annual health benefits relative to the Reference Scenario for the Scoping Plan Scenario (NWL)



As health impacts analyzed here are driven by wildfire emissions, the health benefits for the Scoping Plan Scenario are directly related to the amount of forest, shrubland, and grassland management action. These management actions reduce vegetation fuels and, as a result, wildfire activity. The Scoping Plan Scenario increases the amount of these management actions, reducing wildfire emissions and avoiding incidence of emission-related health effects. The health benefits, or economic value of the avoided incidence of health effects, correspondingly increase with an increasing management implementation rate. Additional details are included in Appendix I (NWL Technical Support Document).

Estimated health benefits do not include the direct impact of wildfires on injuries, deaths, or mental health, nor the indirect costs of lost ecosystem benefits to wildfire. Additional direct health costs may result from wildfire that would likely increase the health benefits from increased forest, shrubland, and grassland management to reduce wildfire activity. Nonetheless, the conservative health benefits under the Scoping Plan Scenario are estimated to be $3.1 billion per year relative to the Reference Scenario for all NWL actions identified in the Scoping Plan Scenario.

AB 197 Measure Analysis

This section provides estimates for information associated with GHG emissions reduction measures evaluated in this Scoping Plan.[221] These estimates, which were developed as part of the process for meeting the requirements of AB 197 (E. Garcia, Chapter 250, Statutes of 2016), provide information on the relative impacts of the evaluated measures when compared to each other. To support the design of a suite of policies that result in GHG reductions, air quality co-benefits, and cost-effective measures, it is important to understand if a measure will increase or reduce criteria pollutants or toxic air contaminant emissions, or if increasing stringency at additional costs yields few additional GHG reductions. To this end, AB 197 requires the following for each potential emissions reduction measure evaluated in any Scoping Plan update:

- The range of projected GHG emissions reductions that result from the measure;
- The range of projected criteria pollutant emission reductions that result from the measure; and
- The cost-effectiveness, including avoided social costs, of the measure.

The following sections describe the evaluation of measures for the AB 32 GHG Inventory sectors and NWL. For the purposes of this Scoping Plan, the identified emissions reduction measures for the analysis required by AB 197 are actions grouped by sectors where several policies and programs are expected to overlap. This approach reflects the most granular feasible analysis given the modeling tools available,[222] the overlap and interaction effects among policies and incentive programs, the longer planning horizon used for this Scoping Plan compared to previous efforts, and the scale of transition needed to achieve carbon neutrality. To implement this Scoping Plan, dozens of individual regulations, policies, and incentive programs are anticipated that work together to drive down emissions across all economic sectors and support actions. Every specific policy or incentive program that could contribute to the deployment of clean technology and energy called for in this plan may overlap in ways that make it infeasible to tease out those policies and programs' individual effects with any reasonable degree of certainty. For example, in the transportation sector, deploying ZEVs and reducing driving demand may be achieved through a combination of the implementation of new or existing regulations, fuels programs, incentive programs, and VMT reduction initiatives that can each contribute to reductions in emissions for the sector. It is not feasible to isolate each sub action from each other at this time in terms of the share of contribution to total reductions. The estimated emission

[221] AB 197 calls for the evaluation of "emission reduction measures." This Scoping Plan treats each action and its variants on stringency as emission reduction measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative.
[222] See Appendix H (AB 32 GHG Inventory Sector Modeling and Appendix I (NWL Technical Support Document).

reductions, health endpoints, and costs by measure for the Scoping Plan Scenario are presented in this chapter, and the corresponding estimates for the Proposed Scenario and Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Because many of the measures and underlying assumptions interact with each other, isolating the GHG emission reductions, corresponding changes to fuel combustion, and associated cost of an individual measure is analytically challenging. Each measure is evaluated by examining the change in fuel combustion, cost, and emissions associated with just that measure using the PATHWAYS model. The difference between the Scoping Plan Scenario and the Reference Scenario is estimated for each measure. Starting from the Scoping Plan Scenario, the modeling assumptions for an individual measure are reverted to the Reference Scenario values, resulting in GHG reductions, changes to fuel combustion, and costs (or savings). This approach does not reflect interactions between sectors in PATHWAYS that influence the results for each complete alternative, presented earlier. As such, the values associated with each measure should not be added to obtain an overall scenario estimate.

To arrive at the 2045 target for NWL, CARB modeled the ecological impact that climate smart land-based management strategies (suites of on-the-ground actions, or *treatments,* that are used across the landscape to manipulate an ecosystem) will have on ecosystem carbon; and whenever possible, additional co-benefits from those actions. The Scoping Plan Scenario incorporates a set of land management actions at varying scales of implementation for each land type to achieve the GHG emission reductions. Each land type, and its associated management actions, was considered a measure for this analysis. For modeling individual landscapes and management actions, CARB used a suite of models. The complexity of these models varies by land type, depending on the existing science, data, and availability of existing models to use. Appendix I (NWL Technical Support Document) provides detailed modeling assumptions for each NWL type. The estimated emission reductions, health endpoints, and costs by measure under the Scoping Plan Scenario for each NWL type are presented in this chapter, and the corresponding estimates for the Proposed Scenario and NWL Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Estimated Emissions Reductions

Both GHG emissions reductions and emissions of criteria air pollutants were evaluated for the AB 32 GHG Inventory sectors and for NWL. The methods and results are described in this section.

AB 32 GHG Inventory Sectors

In the absence of having direct modeling results for criteria pollutant estimates from PATHWAYS, CARB estimated criteria pollutant emissions impacts by using changes in fuel combustion in units of exajoules from PATHWAYS and emission factors in units of tons per exajoule to estimate the change in emissions in tons per year. Emission factors from a variety

of sources for each sector were utilized, including but not limited to CARB's mobile source emissions models,[223] U.S. EPA's AP 42 Emissions Factors,[224] and the South Coast Air Quality Management District's (AQMD's) District Rules.[225] These emission factors were applied to fuel burn change by fuel type, sector, equipment type, and process, where applicable. Statewide annual average emissions were estimated for three criteria pollutants: NO_x, $PM_{2.5}$, and ROG.

Table 3-5 provides the estimated GHG and criteria pollutant emission reductions for the measures in the Scoping Plan Scenario in 2035 and 2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Based on the estimates below, these measures are expected to provide air quality benefits. The estimates provided in this chapter and Appendix C (AB 197 Measure Analysis) are appropriate for comparing across alternatives considered for the development of this Scoping Plan, but they are not precise estimates.

[223] CARB. MSEI - Modeling Tools. *https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools*.
[224] U.S EPA. AP-42: Compilation of Air Emissions Factors. *https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors*.
[225] South Coast AQMD. South Coast AQMD Rule Book. *https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book*.

Table 3-5: Estimated GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario in 2035/2045 (AB 32 GHG Inventory sectors)

Measure	GHG Reductions ($MMTCO_2$)	NOx Reductions (Short Tons/Year)	$PM_{2.5}$ Reductions (Short Tons/ Year)	ROG Reductions (Short Tons/Year)
Deploy ZEVs and reduce driving demand	-46 / -84	-51,620 / -122,806	-2,008 / -6,506	-18,967 / -30,410
Coordinate supply of liquid fossil fuels with declining California fuel demand	-25 / -30	-1,601 / -2,707	-978 / -1,705	-747 / -1,323
Generate clean electricity	-8 / -31	-92 / -1,555	-177 / -1,382	-41 / -425
Measure	**GHG Reductions ($MMTCO_2$)**	**NOx Reductions (Short Tons/Year)**	**$PM_{2.5}$ Reductions (Short Tons/ Year)**	**ROG Reductions (Short Tons/Year)**
Decarbonize industrial energy supply	-9 / -22	-21,172 / -34,876	-1,188 / -2,527	-3,710 / -6,298
Decarbonize buildings	-14 / -35	-8,105 / -94,455	-826 / -6,877	-1,093 / -8,109
Reduce non-combustion emissions[a]	-0.41 / -0.52 ($MMTCH_4$)	N/A	N/A	N/A
Compensate for remaining emissions	-25 / -64	N/A	N/A	N/A

[a] Methane emissions reductions are reported for this measure.

The measures related to reducing non-combustion emissions and compensating for the remaining emissions do not include changes to fuel combustion, and therefore are not

associated with changes to air pollutants. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Natural and Working Lands

NWL ecosystems naturally vary between being a source and a sink for carbon over time. The NWL ecosystem carbon stock changes projected through mid-century by the suite of models were used to estimate net emissions or emissions reductions relative to the Reference Scenario. These changes in carbon stocks were affected by projected climate change, the implementation of management actions under the various scenarios, land conversion, and (for forests, shrublands, grasslands) wildfire. Each NWL type was evaluated, and an overview of all NWL is presented in Table 3-6. More detailed results for each NWL type can be found in Appendix C (AB 197 Measure Analysis).

Table 3-6: Estimated average annual GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario from 2025–2045 (NWL)

Measure	GHG Reductions ($MMTCO_2e$/year)	$PM_{2.5}$ Reductions (MT/Year)
Forests/Shrublands/Grasslands	-0.12	-17,500
Annual Croplands	-0.25	N/A
Perennial Croplands	-0.01	N/A
Urban Forest	-1.29	N/A
Wildland Urban Interface (WUI)	0.75	N/A
Wetlands	-0.43	N/A
Sparsely Vegetated Lands	<-0.01	N/A

Fine particulate wildfire emissions were evaluated for forests, shrublands, and grasslands only. Wildfire emissions decreased under the Scoping Plan Scenario compared to the Reference Scenario. The Scoping Plan Scenario's higher level of management actions that reduce tree or shrub densities, protect large trees, reintroduce fire to the landscape, and diversify species and structures result in greater reductions in wildfire emissions.

Estimated Health Endpoints

Climate change mitigation will result in both environmental and health benefits. This section provides information about the potential health benefits of the Scoping Plan Scenario. Health benefits are primarily the result of reduced $PM_{2.5}$ pollution, both from stationary and mobile sources, as well as wildfire in forests, shrublands, and chaparral.

AB 32 GHG Inventory Sectors

CARB used the criteria pollutant emissions in Table 3-5 to understand potential health impacts. Similar to the air quality estimates, this information should be used to understand the relative health benefits of the various measures and should not be taken as absolute estimates of health outcomes. CARB used the incidence-per-ton (IPT) methodology to quantify the health benefits of emission reductions. The IPT methodology is based on a methodology developed by the U.S.

EPA.[226,227,228,229] Under the IPT methodology, changes in emissions are approximately proportional to the resulting changes in health outcomes. IPT factors are derived by calculating the number of health outcomes associated with exposure to $PM_{2.5}$ for a baseline scenario using measured ambient concentrations and dividing that number by the emissions of $PM_{2.5}$ or a precursor. To estimate the reduction in health outcomes, the emission reductions are multiplied by the IPT factor. For future years, the number of outcomes is adjusted to account for population growth. IPT factors were computed for the two types of $PM_{2.5}$: primary $PM_{2.5}$ and secondary $PM_{2.5}$ of ammonium nitrate aerosol formed from precursors.

For this AB 197 analysis, CARB calculated the health benefits associated with the five key measures that are represented by changes to fuel combustion. The health benefits associated with emission reductions for the Scoping Plan Scenario were estimated for each air basin and then aggregated for the entire state of California. CARB assumed that the statewide emission reductions distribution among the air basins is proportional to the baseline emissions in that air basin.

Calculated health endpoints include premature mortality, cardiovascular emergency department (ED) visits, acute myocardial infarction, respiratory ED visits, lung cancer incidence, asthma onset, asthma symptoms, work loss days, hospitalizations due to cardiopulmonary illnesses, hospitalizations due to respiratory illnesses, hospital admissions for Alzheimer's disease, and hospital admissions for Parkinson's disease.[230,231,232] These health endpoints were calculated using the IPT method for estimated emission reductions. Table 3-7 compares the health benefits of emission reductions associated with each measure for the Scoping Plan Scenario in the year

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[226] CARB. CARB's Methodology for Estimating the Health Effects of Air Pollution. Retrieved February 9, 2021. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[227] Fann, N., C. M. Fulcher, and B. J. Hubbell. 2019. "The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution." *Air Quality, Atmosphere & Health* 2:169–176. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/*.

[228] Fann, N., K. R. Baker, and C. M. Fulcher. 2012. "Characterizing the $PM_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S." *Environ Int*. 49:141–51. November 15. *https://www.sciencedirect.com/science/article/pii/S0160412012001985*.

[229] Fann, N., K. Baker, E. Chan, A. Eyth, A. Macpherson, E. Miller, and J. Snyder. 2018. "Assessing Human Health $PM_{2.5}$ and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025." *Environ. Sci. Technol.* 52 (15), 8095–8103. *https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050*.

[230] CARB. CARB's Methodology. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[231] CARB. 2022. Updated Health Endpoints in CARB's Health Benefits Methodology. *Evaluating New Health Endpoints for Use in CARB's Health Analyses*.

[232] Cardio-pulmonary mortality, hospitalizations due to cardiopulmonary illnesses, and hospital admissions due to respiratory illnesses endpoints utilize studies documented in CARB's methodology document. For future assessments, CARB will use more recent studies to estimate cardiovascular hospital admissions and respiratory hospital admissions, as documented in CARB's updated health endpoints memo.

specified (2035 or 2045). The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-7: Estimated avoided incidence of mortality, cardiovascular and respiratory disease onset, work loss days and hospital admissions relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Deploy ZEVs and reduce driving demand in 2035	635	170	70	400	45	1,475	128,930	92,510	95	115	245	40
Deploy ZEVs and reduce driving demand in 2045	1,820	475	200	1,115	135	3,995	343,095	255,800	295	350	745	125
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2035	115	30	15	70	10	275	23,530	16,880	20	20	50	10

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2045	215	55	25	130	15	490	40,860	30,445	35	40	95	15
Generate clean electricity in 2035	20	5	0	10	0	45	3,930	2,820	5	5	10	0
Generate clean electricity in 2045	170	45	20	105	15	385	32,065	23,890	25	30	75	10
Decarbonize industrial energy supply in 2035	300	80	35	190	20	695	60,660	43,520	45	55	115	20
Decarbonize industrial energy supply in 2045	595	155	65	365	45	1,310	111,925	83,435	95	115	245	40

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Decarbonize buildings in 2035	155	40	15	95	10	360	31,130	22,335	25	30	60	10
Decarbonize buildings in 2045	1,610	420	175	985	120	3,550	303,830	226,500	260	310	665	115
Note: All values are rounded to the nearest 0 or 5.												

The measures related to reducing non-combustion emissions and compensating for remaining emissions do not include changes to fuel combustion and therefore are not associated with changes to air pollutants or health endpoints. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Although the estimated health outcomes presented are based on a well-established methodology, they are subject to uncertainty. For instance, future population estimates are subject to increasing uncertainty as they are projected further into the future, and baseline incidence rates can experience year-to-year variation. Also, the relationship between changes in pollutant concentrations and changes in pollutant or precursor emissions is assumed to be approximately proportional.

In addition, emissions are reported at an air basin level and do not capture local variations. These estimates also do not account for impacts from global climate change, such as temperature rise, and are only based on the scenarios in this Scoping Plan.

The fuel changes for each AB 197 measure are estimated based on the impact of each measure compared to the Reference Scenario for the years 2035 and 2045. Therefore, aggregating the effect of each measure would overestimate the impacts of the Scoping Plan Scenario because the implementation of each measure would affect the level of benefits of the other measures. This measure-by-measure analysis uses a different methodology for calculating health endpoints than does the health analysis for the complete Scoping Plan Scenario provided earlier.

Natural and Working Lands

Implementation of NWL management strategies to mitigate and adapt to climate change will result in both environmental and health benefits. This section provides information about the potential health benefits of measures evaluated for the Scoping Plan Scenario. For this analysis, health benefit estimates were focused on increases or decreases to $PM_{2.5}$ resulting from wildfire emissions on forests, shrublands, and grasslands.[233] Other health benefits resulting from NWL management actions in the Scoping Plan Scenario are not quantified here but are important for all Californians. This includes, but is not limited to, reductions in exposure to synthetic pesticides when switching to organic agricultural systems, improvements in shade availability and mental health with increasing urban forest cover, improved mental health from opportunities for recreation in resilient and healthy environments, and protection from floods and rising sea levels.

[233] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. *finalejacrecs.pdf (arb.ca.gov)*.

These examples are by no means exhaustive, as our natural and working lands provide immense health benefits to everyone.

For this analysis, CARB used the $PM_{2.5}$ emissions in Table 3-6 to understand potential health impacts. This information should be used to understand the relative health endpoints of the various measures and should not be taken as absolute estimates of health outcomes of this Scoping Plan statewide or within a specific community. The IPT methodology was used to calculate health endpoints, similar to the AB 32 GHG Inventory Sector analysis. CARB calculated the annual health endpoints associated with the wildfire emissions changes resulting from the implementation of management strategies on forests, shrublands, and grasslands under each alternative. The annual health endpoints associated with emission reductions for the Scoping Plan Scenario were estimated for the entire state. Calculated health endpoints include emissions-caused mortality, hospital admittance, and emergency room visits from asthma; hospital admittance from chronic obstructive pulmonary disease; and emergency room visits from respiratory and cardiovascular outcomes. Table 3-8 compares the average annual health endpoints of wildfire emission reductions associated with the Scoping Plan Scenario over the period 2025–2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-8: Estimated average annual avoided incidence of hospital admissions, emergency room visits, and mortality relative to the Reference Scenario for the Scoping Plan Scenario resulting from forest, shrubland, and grassland wildfire emissions (NWL)

Health Endpoints from Forest, Shrubland, and Grassland Wildfire Emissions	Average Annual Avoided Incidence
Hospital admissions from asthma	22
Hospital admissions from chronic obstructive pulmonary disease without asthma	19
Hospital admissions from all respiratory outcomes	63
Emergency room visits from asthma	155
Emergency room visits from all respiratory outcomes	419
Emergency room visits from all cardiovascular outcomes	156
All causes of mortality	394

Estimated Social Cost

Social costs are generally defined as the cost of an action on people, the environment, or society and are widely used to understand the impact of regulatory actions. One tool, the social cost of greenhouse gases (SC-GHG), is an estimate of the present value of the costs associated with the emission of GHGs in future years. It combines climate science and economics to help understand the benefits of reducing GHG emissions. The estimates of the social cost of carbon ($SC\text{-}CO_2$) and social cost of methane ($SC\text{-}CH_4$), two types of SC-GHGs presented here, estimate the value of the net harm to society associated with adding GHGs to the atmosphere in a given year; they do not represent the cost of actions taken to reduce GHG emissions (known as the *cost of abatement*) nor the cost of GHG emissions reductions. In principle, the SC-GHG includes the value of climate change impacts, including but not limited to, changes in net agricultural productivity, human health effects, property damage from increased flood risk and other natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. It reflects the societal value of reducing emissions

of the gas in question by one metric ton.[234] Many of these damages from GHG emissions today will affect economic outcomes throughout the next several centuries.

In 2008, federal agencies began incorporating SC-CO_2 estimates into the analysis of their regulatory actions. U.S. EPA has used various models and discount rates to determine the value of future impacts. Generally, these models begin with assumptions to predict economic activity over time, along with projected GHG emissions. The modeled emissions are input into a model of the global climate system, which then translates into estimates of surface temperature, sea level rise, and other impacts. These outputs are used to estimate economic damages per ton of GHG emitted in a given year in the future. Since the models are calculating the present value of future damages, a discount rate is applied. For example, the SC-CO_2 for the year 2045 represents the value of climate change damages from a release of CO_2 in 2045 discounted back to today. The present value is significantly affected by the discount rate used; a higher discount rate results in a lower present value. For example, in 2021 dollars the SC-CO_2 in 2045 is $31 using a 5 percent discount rate, $88 using a 3 percent discount rate, and $122 using a 2.5 percent discount rate. Additional detail is included in Appendix C (AB 197 Measure Analysis).

The 2017 Scoping Plan utilized SC-CO_2 and SC-CH_4 Obama Administration-era values developed by the Council of Economic Advisors and the Office of Management and Budget-convened Interagency Working Group on the Social Cost of Greenhouse Gases (IWG)[235] to consider the social costs of actions to reduce GHG emissions. The Biden Administration reinstated these values in February 2021,[236] after they had been rescinded and significantly revised by the Trump Administration. The reinstatement was considered an interim step, and the Biden Administration also reconvened the IWG to continue its work to evaluate and incorporate the latest climate science and economic research and

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[234] U.S. Government. Interagency Working Group on Social Cost of Greenhouse Gases. February 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide – Interim Estimates under Executive Order 13990. *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*

[235] Originally titled the "Interagency Working Group on the Social Cost of Carbon," the IWG was renamed in 2016. 82 Fed. Reg. 16093, 16095-96 (Mar. 28, 2017). *https://www.govinfo.gov/content/pkg/FR-2017-03-31/pdf/2017-06576.pdf*.

[236] Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, Executive Order 13990 (Jan. 20, 2021), 86 Fed. Reg. 7037 (Jan. 25, 2021). *https://www.energy.gov/sites/default/files/2021/02/f83/eo-13990-protecting-public-health-environment-restoring.pdf*. IWG, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990 (February 2021), *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf* See also, The White House. 2021. A Return to Science: Evidence-Based Estimates of the Benefits of Reducing Climate Pollution. *https://www.whitehouse.gov/cea/written-materials/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/*.

respond to the National Academies' recommendations from 2017 as it develops a more complete revision of the estimates.

It is important to note that the models used to produce SC-GHG estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate literature. There are additional costs to society, including the costs associated with changes in co-pollutants and costs that cannot be included due to modeling and data limitations. The IWG has stated that the range of the interim SC-GHG estimates likely underestimates societal damages from GHG emissions.[237] The revised estimates were originally slated to be released in early 2022 but were stalled.[238] CARB staff is applying the interim values presented in the IWG February 2021 Technical Support Document (TSD), which reflect the best available science in the estimation of the socioeconomic impacts of GHGs.[239] This Scoping Plan utilizes the TSD standardized range of discount rates, from 2.5 to 5 percent, to represent varying valuation of future damages.

AB 32 GHG Inventory Sectors

Table 3-9 presents the estimated social cost, in terms of avoided economic damages, for each measure of the Scoping Plan Scenario. For each measure, Table 3-9 includes the range of the SC-CO_2 and SC-CH_4 that results from the GHG emissions reductions in 2035 and 2045 at 2.5 and 5 percent discount rates. Additional background on the SC-GHG and methodology for calculating the SC-CO_2 and SC-CH_4 estimates in this Scoping Plan, as well as estimates for the alternatives, are provided in Appendix C (AB 197 Measure Analysis).

[237] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*

[238] See *Louisiana v. Biden* (W.D. La. 2022) 585 F.Supp.3d 840, stayed pending review (5th Cir. Mar. 16, 2022) 2022 WL 866282. A federal district court ruling issued in early February 2022 had granted a preliminary injunction blocking the Biden Administration from using the interim IWG SC-GHG estimates. However, a federal appeals court overturned the lower court's preliminary injunction in March 2022, which allows the Biden Administration to continue using the policy as legal proceedings continue. CARB will continue to monitor the litigation. However, the federal action does not prohibit CARB from using social cost of carbon and CARB will use the best available science regardless of politics. A separate federal appeals court upheld the Biden administration's use of the IWG SC-GHG estimates in October 2022. *Missouri v. Biden* (8th Cir. 2022) ____ F.4th ____.

[239] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*

Table 3-9: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Deploy ZEVs and reduce driving demand	1.12–4.87	2.64–10.23
Coordinate supply of liquid fossil fuels with declining California fuel demand	0.61–2.63	0.95–3.67
Generate clean electricity	0.20-0.88	0.97–3.75
Decarbonize industrial energy supply	0.23–1.01	0.69–2.67
Decarbonize buildings	0.35–1.52	1.11–4.32
Reduce non-combustion emissions	0.51–1.29 (SC-CH_4)	0.86–2.01 (SC-CH_4)
Compensate for remaining emissions	0.61–2.66	2.03–7.84
Scoping Plan Scenario SC-CO_2	2.4–10.4	5.6–21.9
Scoping Plan Scenario SC-CH_4	0.51–1.3	0.86–2.0
Scoping Plan Scenario (Total)[a]	2.9–11.7	6.5–23.9

[a] CARB staff could not precisely separate some CO_2 and CH_4 from other GHGs from PATHWAYS outputs, but the contribution is believed to be small for purposes of calculating the social cost of carbon. The approach used to estimate GHG emissions reductions for individual measures in PATHWAYS does not reflect cross-sector interactions. Therefore, the GHG values for each measure do not sum to the overall scenario total. The total GHG emissions reduction used in this calculation is 97 $MMTCO_2e$ in 2035 and 180 $MMTCO_2e$ in 2045.

Natural and Working Lands

The SC-CO_2 estimates for the NWL measures shown in Table 3-10, in terms of avoided economic damages, reflect 2021 IWG interim values, updated for inflation, similar to the AB 32 GHG Inventory Sector analysis. This analysis utilizes the 2.5 percent and 5 percent

discount rate and the average annual emissions reductions from each NWL type from 2025–2045. Estimates for all alternatives are included in Appendix C (AB 197 Measure Analysis).

Table 3-10: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (NWL)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Forests/Shrublands/Grasslands	0.003–0.012	0.004–0.014
Annual Croplands	0.006–0.027	0.008–0.031
Perennial Croplands	<0.001–0.001	0.000–0.001
Urban Forest	0.032–0.138	0.041–0.157
Wildland Urban Interface (WUI)	(0.018) – (0.080)[a]	(0.023) – (0.090)
Wetlands	0.011–0.046	0.014–0.053
Sparsely Vegetated Lands	<0.001	<0.001

[a] Parentheses indicate an increase in estimated social cost, i.e., an increase in economic damages. This is only the case for WUI measures where emissions are increased, shown in Table 3-6. The estimated social cost does not account for the decrease in wildfire risk or decrease in wildfire damages resulting from the WUI measures.

Social Costs of GHGs in Relation to Cost-Effectiveness

AB 32 includes a requirement that rules and regulations "achieve the maximum technologically feasible and cost-effective" greenhouse gas emissions reductions.[240] Under AB 32, *cost-effectiveness* means the relative cost per metric ton of various GHG reduction strategies,[241] which is the traditional cost metric associated with emission control. In contrast, the SC-CO_2, SC-CH_4, and social cost of nitrous oxide (SC-N_2O), because they are estimates of the cost to society of additional GHG emissions, can be used to estimate of the economic benefits of reducing emissions, but do not take into account the cost of the actions that must be taken to achieve those GHG emissions reductions.

There may be technologies or policies that do not appear to be cost-effective when compared to the SC-CO_2, SC-CH_4, and SC-N_2O associated with GHG reductions. However, these technologies or policies may result in other benefits that are not reflected in the IWG social costs. Examples include the evaluation of social diversification of the portfolio of transportation fuels (a goal outlined in the Low Carbon Fuel Standard) and reductions in criteria pollutant emissions from power plants (as in the Renewables Portfolio Standard). Additionally, costs for new technology may be higher early on in a technology's development cycle and may drop over time as use of the technology is scaled up.

Estimated Cost per Metric Ton

AB 197 requires an estimation of the cost-effectiveness of the measures evaluated for this Scoping Plan. The cost (or savings)[242] per metric ton of CO_2e reduced for each measure is one metric for comparing the performance of the measures. Additional factors beyond the cost per metric ton that could be considered include continuity with existing laws and policies, implementation feasibility, contribution to fuel diversity and technology transformation goals, and health and other benefits to California. These considerations are not reflected in the cost per metric ton estimates presented below. It is important to understand the relative cost-effectiveness of individual measures as presented in this section. However, the economic analysis presented earlier in this chapter, in Appendix H

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[240] AB 32 Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[241] Health & Saf. Code § 38505(d).

[242] Similarly, to the direct costs reported earlier, the cost per metric ton of a measure reflects the stock costs and any fuel or efficiency savings associated with a measure divided by the GHG emission reduction achieved by the measure. Costs are reported as positive values, and savings are reported as negative values.

(AB 32 GHG Inventory Sector Modeling), and in Appendix I (NWL Technical Support Document) provides a more comprehensive analysis of how the Scoping Plan Scenario and alternative scenarios affect the state's economy and jobs.

AB 32 GHG Inventory Sectors

The cost per metric ton for the AB 32 GHG Inventory sectors was computed for each measure independently relative to the Reference Scenario using the sensitivity calculations based on PATHWAYS and RESOLVE outputs. The difference in the annualized cost between the Scoping Plan Scenario and the Reference Scenario was computed for each measure in 2035 and in 2045. The incremental cost was divided by the incremental GHG emissions impact to calculate the cost per metric ton in each year. To capture the fuel and GHG impacts of investments made from 2022 through 2035, or from 2022 through 2045, CARB computed an average annual cost per metric ton. The incremental cost in each year was averaged over the period. This value is divided by the corresponding annual, incremental GHG impact averaged over the same period.

The cost metric includes the annualized incremental cost of energy infrastructure, such as zero-emission vehicles, electric appliances, and required revenue to support all electric assets. A residual value for equipment such as vehicles or appliances that are retired early is included. The annual fuel cost or avoided fuel cost that results from efficiency improvements or changes to demand for fuels associated with transitioning to alternative fuels is included. Not included in this cost metric are costs that represent transfers within the state, such as incentive payments for early retirement of equipment.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, the values do not capture fuel savings or GHG reductions associated with the full economic lifetime of measures that have been implemented by the target date of 2035 or 2045 but whose impacts extend beyond the target date.

Table 3-11 includes the cost per metric ton and annual average cost per metric ton estimates for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Measures that are relatively less costly in 2035 or 2045 are also less costly over the extended period. As noted earlier, incremental costs of new vehicles are generally offset by gains in efficiency and avoided fuel consumption resulting in negative cost per metric ton.

Table 3-11: Estimated cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Annual Cost, 2035 ($/ton)	Average Annual Cost, 2022–2035 ($/ton)	Annual Cost, 2045 ($/ton)	Average Annual Cost, 2022–2045 ($/ton)
Deploy ZEVs and reduce driving demand	-171	-99	-103	-122
Coordinate supply of liquid fossil fuels with declining CA fuel demand	60	109	-50	39
Generate clean electricity[a]	101	156	145	161
Decarbonize industrial energy supply	290	217	257	274
Decarbonize buildings	235	230	112	213
Reduce non-combustion emissions	93	94	106	99
Compensate for remaining emissions	745	823	236	485

[a] Note: The denominator of this calculation (2045) does not include GHG reductions occurring outside of California resulting from SB 100. If these reductions were included, this number would be lower.

Natural and Working Lands

The cost per metric ton for NWL measures were computed for the Scoping Plan Scenario relative to the Reference Scenario using the projected carbon stock/sequestration data from the NWL modeling and the direct cost estimates for each management action, described earlier. Direct costs represent the cost of implementing a certain management action. The projected emissions reductions take into account the loss of carbon that results from the management action, such as fuels reduction treatments in forests, as well as climate change effects on growth. The direct cost for each NWL measure was divided by the average annual emission reductions presented in Table 3-6 to produce the cost

per metric ton. The increasing effect of climate change on diminished future growth reduces the ability of the land to sequester or store carbon, driving up the cost per ton.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, emissions benefits of NWL management actions often take longer time periods to accrue, and these values only capture GHG reductions up to 2045.

Table 3-12 includes the average cost per metric ton estimates for the average annual CO_2e reductions from 2025 through 2045 for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-12: Estimated average cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (NWL)

Measure	Average Cost per Reduced Ton CO_2e ($/Ton)
Forests/Shrublands/Grasslands	15,500
Annual Croplands	1,100
Perennial Croplands	412
Urban Forest	3,270
Wildland Urban Interface (WUI)	N/A
Wetlands	64
Sparsely Vegetated Lands	451,000

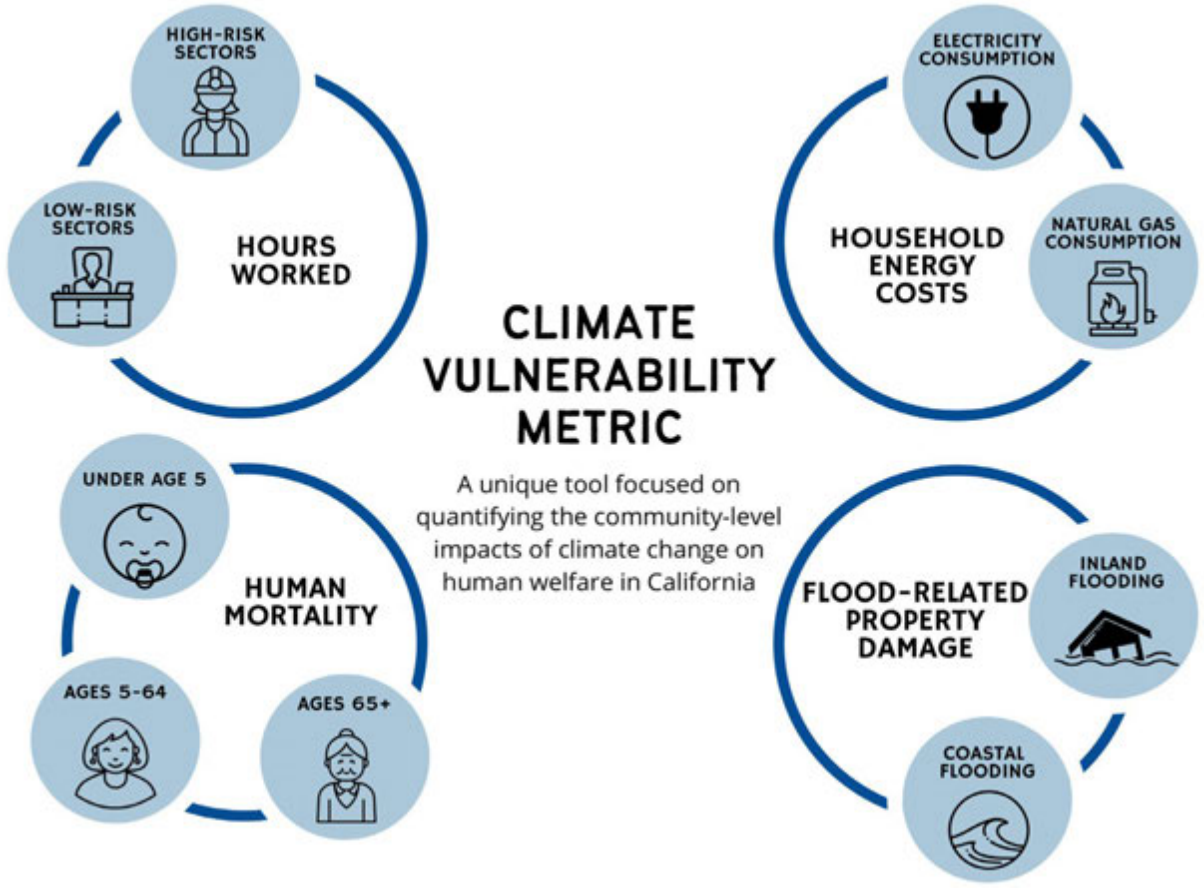
Climate Vulnerability Metric

As California invests in climate mitigation and adaptation, it is essential to understand that the relative impact of climate change will vary across the state's communities. Due to persisting health and opportunity gaps, not all communities are equally resilient in the face of climate impacts. A global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional economic impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare and the additional costs. Additional details and results are included in Appendix K (Climate Vulnerability Metric).

The CVM aggregates the impacts of climate change that can be quantified at the census tract level using robust and currently available research. The CVM includes the projected impacts of climate change on human welfare across four categories (hours worked, household energy costs, human mortality, and flood-related property damage) through midcentury. The CVM identifies nine components of the four climate impacts as shown in Figure 3-9 and aggregates the data to generate a total CVM result for each census tract. To ensure that the CVM represents the diversity of California communities, it is reported as the aggregate monetized impact of climate change as a percentage of census tract-specific incomes.[243] For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income in that tract.

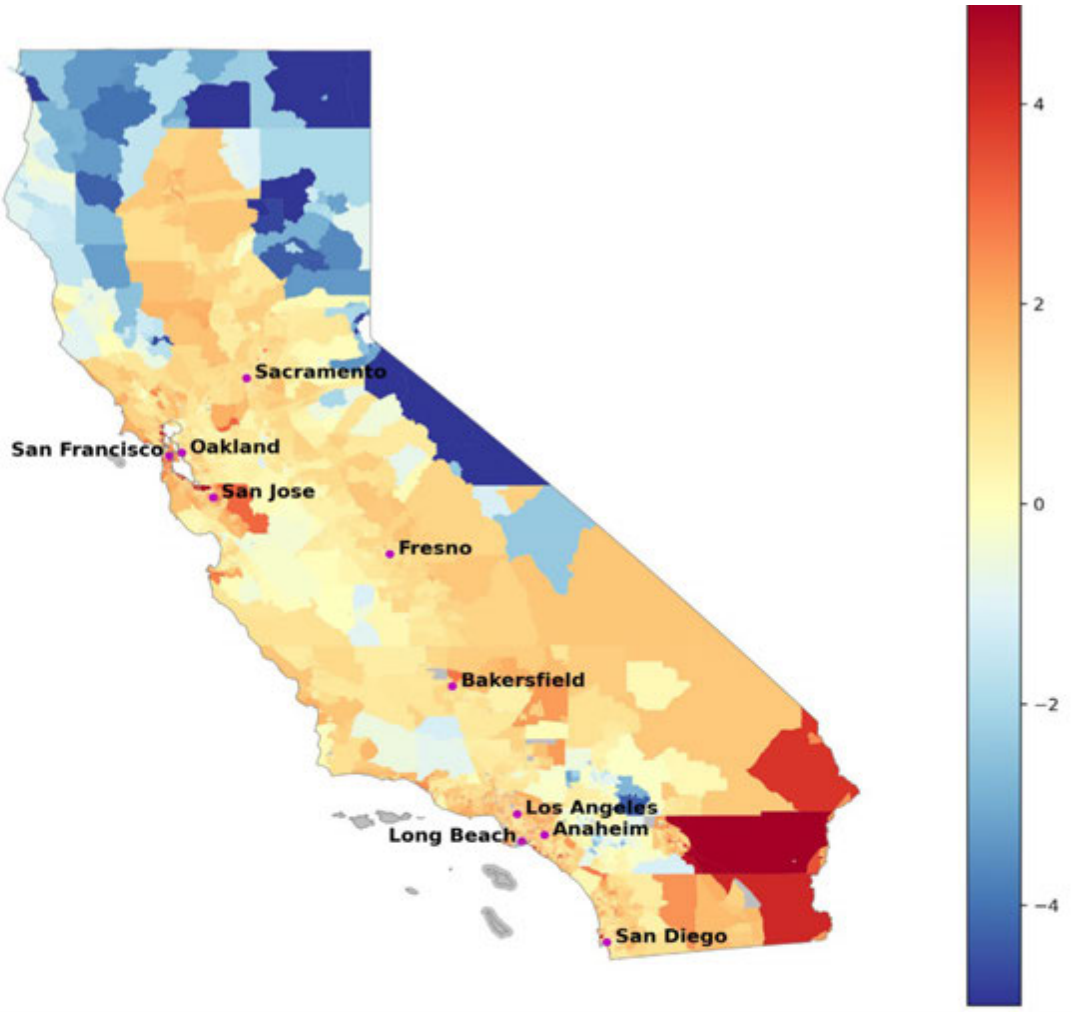
[243] Per capita income in 2019 for census tracts across California ranges from $633 to $176,388, with a median of $32,181 ($2019). Source: American Community Survey.

Figure 3-9: Categories of climate change impacts on human welfare included in the Climate Vulnerability Metric.



The CVM shows that climate change will have highly unequal impacts across California. While some southeastern regions of California are estimated to suffer damages that exceed 5% of annual income, other high-elevation northeastern regions of California are estimated to see benefits of up to 10%. Some low-lying urban areas, such as the San Francisco Bay Area, are estimated to be particularly vulnerable, while much of the Central Valley is estimated to suffer at least moderate economic damages relative to the rest of the state. It is important to note that the CVM does not set a threshold for vulnerability. Instead, it shows relative impacts across census tracts. The CVM is limited to the impacts that can currently be quantified at the census tract level.

Figure 3-10: Combined impacts of climate change in 2050 under a moderate emissions scenario; damages as share of 2019 tract income (%)



The map shows combined impacts of climate change in 2050 under a moderate emissions scenario (RCP 4.5), reported as a share of 2019 census tract income. For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income. Impacts are combined across the categories shown in Figure 3-9. The higher the CVM for a given census tract, the more damaging the projected impacts of climate change on human welfare. Census tracts with high CVMs are represented by positive percentages in orange and red. A lower CVM is associated with lower projected impacts of climate change, shown in yellow, while a negative CVM value represents a projected beneficial impact of climate change (e.g., through reductions in deaths caused by extremely cold winter weather). Negative CVMs are represented by negative percentages in blue.

By providing information about how climate vulnerability varies across California (Figure 3-10), the CVM results can be used to direct resources to enhance resiliency in the state's

most vulnerable communities based on the specific impacts, such as heat or flooding, they are experiencing. The CVM may be used in combination with existing screening tools, such as CalEnviroScreen 4.0, to identify communities that face environmental and health hazards that contribute to disproportionate economic impacts in addition to climate vulnerability. The CVM can become an essential source of information to implement this Scoping Plan and build a more resilient, just, and equitable future for all communities.

Public Health

Health Analysis Overview

This section focuses on a broader evaluation of public health and climate change. Science demonstrates that taking action to address climate change presents one of the most significant opportunities to improve public health outcomes.[244] Transitioning to clean energy and technology and improving land and ecosystem management will lead to a much healthier future. Many actions to reduce GHG emissions also have health co-benefits that can improve the health and well-being of populations across the state, as well as address climate change. This section and the accompanying Appendix G (Public Health) provide a qualitative analysis of health benefits to accompany the quantitative health analysis included in this chapter, in Appendix C (AB 197 Measure Analysis), and in Appendix H (AB 32 GHG Inventory Sector Modeling). Together the qualitative and quantitative analyses of benefits are demonstrating the many ways that climate action and health improvements go hand in hand.

Climate change can lead to a wide range of direct health impacts such as increased heat-related illnesses (i.e., heat exhaustion and heat stroke), and injuries and deaths from extreme weather events or disasters (e.g., severe storms, flooding, wildfires). Indirect impacts include:

- more air pollution-related exacerbations of cardiovascular and respiratory diseases (e.g., due to increased smog, wildfire smoke)
- increased vector-borne and fungal diseases due to changes in the distribution and geographic range of disease-carrying species (e.g., mosquitoes, ticks, fungi in dust)
- negative nutritional consequences related to decreases in agricultural food yields
- stress and mental trauma due to extreme weather-related catastrophes
- anxiety, depression, and other mental health impacts associated with gradual changes in the climate (e.g., prolonged drought or temperature shifts affecting jobs and industries) that result in unemployment and income loss

[244] Watts, N., W. N. Adger, P. Agnolucci, et al. 2015. “Health and climate change: Policy responses to protect public health.” *Lancet* 386, 1861–1914.

- residential displacement and home loss (e.g., sea level rise impacting coastal communities)

Wildfires and wildfire smoke are one area where we have already seen and expect to see even further drastic impacts on the health of Californians. According to CalFire, since 1932 the top eight largest wildfires in California have occurred in the past five years (2017–2022), with 151 deaths due directly to fires during that period.[245] Researchers estimate that wildfire smoke during fall 2020 may have led to as many as 3,000 excess deaths, with at least 95% of Californians suffering unhealthy levels of particle pollution due to wildfires in 2020.[246] Continued climate change is projected to further increase smoke exposure from wildfires through the end of the century.[247] Wildfires also create a high-risk environment for outdoor workers, including agricultural workers. While the direct medical and physical health impacts are often most noticeable, the psychological impacts can develop and persist well after the event. Estimates indicate that 20%–65% of survivors of extreme weather events have mental health issues following the event.[248]

Extreme heat, drought, and associated worsened air quality impacts are among the most serious climate-related exposures affecting the health of Californians. Numerous studies find a wide range of adverse health effects accompanying extreme heat, including heat stroke and adverse birth outcomes, and find that extreme heat can harm most body systems. Climate change exacerbates air pollution problems that cause difficulty breathing and can lead to serious illness and death in many parts of California. Increasing temperatures cause increases in ozone and other pollution concentrations, including for California's most polluted regions, and heighten health risks for the vulnerable and marginalized populations living in these areas.[249] In 2020, there were 157 ozone polluted days across Los Angeles, Orange, Riverside, and San Bernardino Counties—the most days since 1997. In addition, particulate matter exposure is a heightened problem during

[245] California Department of Forestry and Fire Protection (CAL FIRE). "Stats and Events." *Cal Fire Department of Forestry and Fire Protection*, https://www.fire.ca.gov/stats-events/.
[246] G-FEED. 2020. Indirect mortality from recent wildfires in CA. *http://www.g-feed.com/2020/09/indirect-mortality-from-recent.html*.
[247] M. D. Hurteau, A. L. Westerling, C. Wiedinmyer, and B. P. Bryant. 2014. "Projected effects of climate and development on California wildfire emissions through 2100." *Environ. Sci. Technol.* 48, 2298–2304.
[248] American Public Health Association. 2019. Addressing the Impacts of Climate Change on Mental Health and Well-Being. Policy No: 20196. *https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2020/01/13/addressing-the-impacts-of-climate-change-on-mental-health-and-well-being*.
[249] American Lung Association. State of the Air 2021. *https://www.lung.org/research/sota*.

droughts, which are expected to increase over this century.[250,251] Worse air quality leads to illnesses, emergency room visits, and hospitalizations for chronic health conditions, including chronic obstructive pulmonary disease (COPD), asthma, chronic bronchitis, and other respiratory and cardiovascular conditions, as well as increased risk for respiratory infections, which all result in greater health costs to the state.[252,253,254] These and other climate-related health impacts are discussed in more detail in Appendix G (Public Health).

Health Analysis Components

This Scoping Plan health analysis focuses on the contrast between a California that is still dependent on a fossil fuel-based economy and a California that is transitioned to a carbon-neutral, clean energy future. This qualitative analysis evaluates and demonstrates the broad range of benefits of a dramatic reduction in fossil fuels by 2045 combined with healthier ecosystem management, comparing health outcomes for a "no-action" scenario (Reference) to a "take-action" decarbonization scenario. As this is a qualitative analysis, it looks more broadly at the public health benefits of a drastic reduction in fossil fuel combustion. While this analysis provides scientific evidence for Scoping Plan benefits based on achieving carbon neutrality by 2045, it does not analyze a specific scenario.

The key areas of focus for the analysis are: heat impacts, children's health and development, economic security, food security, mobility and physical activity, urban greening, wildfires and smoke impacts, and housing affordability. For each area of focus, the analysis covers the scientific evidence and compares expected health effects between the Reference and decarbonization scenarios. This analysis looks at the major health outcomes, provides directional effects for each health outcome, and where possible provides information on the strength and scale of health impacts. Some areas include quantitative information where tools are available to measure health outcomes. While the analysis is focused on health outcomes statewide, it also includes discussion

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[250] Cvijanovic, I., B. D. Santer, C. Bonfils, et al. 2017. "Future Loss of Arctic Sea-ice Cover Could Drive a Substantial Decrease in California's Rainfall." 8 *Nat. Commun.* 1947. https://doi.org/10.1038/s41467-017-01907-4.

[251] Williams, A. P., R. Seager, J. T. Abatzoglou, B. I. Cook, J. E. Smerdon, and E. R. Cook. 2015. "Contribution of anthropogenic warming to California drought during 2012–2014." *Geophysical Research Letters* 42(16), 6819–6828.

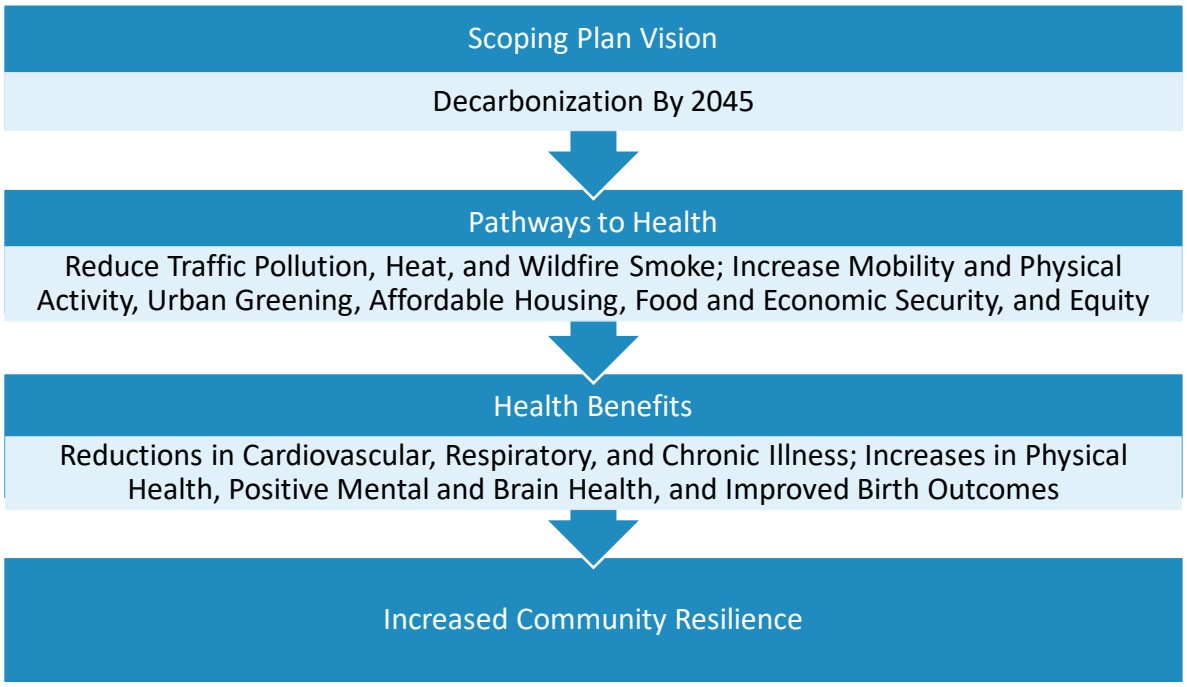
[252] Romley, J. A., A. Hackbarth, and D. P. Goldman. 2010. Cost and Health Consequences of Air Pollution in California. Santa Monica, California. RAND Corp. https://www.rand.org/pubs/research_briefs/RB9501.html.

[253] Wang, M., C. P. Aaron, J. Madrigano, E. A. Hoffman, E. Angelini, J. Yang, A. Laine, et al. 2019. "Association between long-term exposure to ambient air pollution and change in quantitatively assessed emphysema and lung function." *JAMA* 322(6), 546–556.

[254] Inserro, A. 2018."Air Pollution Linked to Lung Infections, Especially in Young Children." *Am. J. Managed Care* (May 6). https://www.ajmc.com/view/air-pollution-linked-to-lung-infections-especially-in-young-children.

of benefits to community health and climate resilience, as well as potential inequities experienced at a community level. Figure 3-11 shows the co-benefit areas covered in this Scoping Plan and the path to health improvements and increased community resilience.

Figure 3-11: Scoping Plan outcome and the path to health improvements

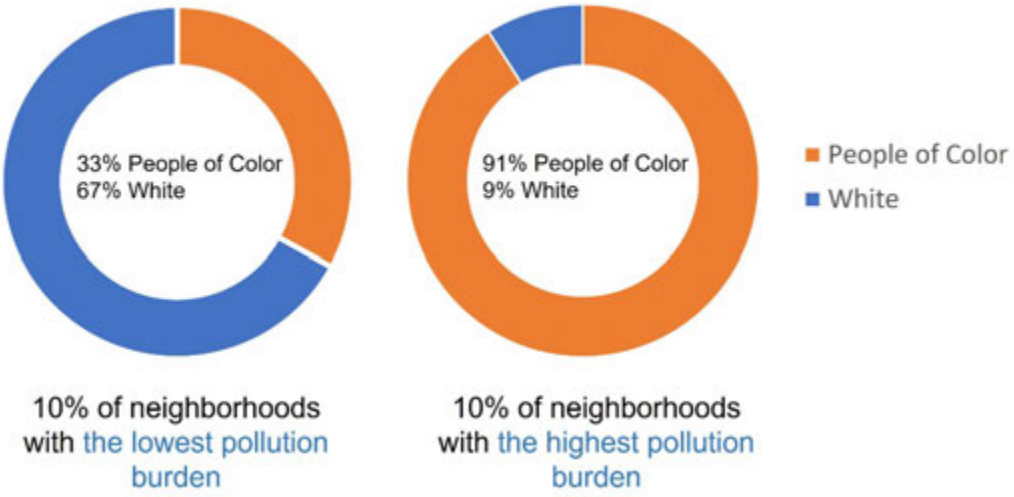


Social and Environmental Determinants of Health Inequities

Communities across the state do not experience exposure to pollution sources and the resulting effects equally. Low-income communities and communities of color (including Black, Latino and Indigenous communities) consistently experience significantly higher rates of pollution and adverse health conditions than others due to factors including historic marginalization rooted in systemic racism. As shown in Figure 3-12, the most impacted neighborhoods according to CalEnviroScreen (CES) are home to very high percentages of people of color while the least impacted neighborhoods are predominantly white. Recent findings show that Black Californians have 19% higher $PM_{2.5}$ exposure from vehicle emissions than the state average, and the census tracts with the highest $PM_{2.5}$ pollution burden from vehicle emissions have a high proportion of people of color.[255] Air pollutant emissions from mobile sources have disproportionate impacts on low-income communities and communities of color due to their proximity.[256] Diesel-fueled vehicles traveling on California's freeways and major roads expose nearby residents to pollution that is linked to lung cancer, hospitalizations and emergency department visits for chronic heart and lung disease, and premature death.[257,258] A combination of historical and social inequities are evident in communities of color disproportionately living close to freeways and other major sources of vehicle pollution. Environmental exposures and contaminants are one component of a broader set of social, economic, and environmental factors that can amplify health conditions, and the combination of all these factors can compound the health effects of individual exposures. This broader set of community factors can be referred to as "cumulative impacts." In addition, specific populations are more sensitive to pollution and face greater susceptibility. This includes young children, older adults, and individuals with existing health conditions.

[255] Reichmuth, D. 2019. *Inequitable exposure to air pollution from vehicles in California.* https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019.
[256] CARB. 2017. *California's 2017 climate change scoping plan.* https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.
[257] CARB. 2020. Overview: Diesel exhaust & health. https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health.
[258] Kagawa, J. 2002. "Health effects of diesel exhaust emissions—a mixture of air pollutants of worldwide concern." *Toxicology* 181–182:349–353.

Figure 3-12: Least and most impacted neighborhoods from CalEnviroScreen[259]



Social Determinants of Health Inequities

The physical and mental health of individuals and communities is shaped, to a great extent, by the social, economic, and environmental circumstances in which people live, work, play, and learn. According to the World Health Organization, these same circumstances—or social determinants of health—are "mostly responsible for health inequities: the unfair and avoidable differences in health status seen within and between countries." In fact, a strong body of research demonstrates that more than 50 percent of long-term health outcomes are the result of social determinants affecting an individual.[260] Race/ethnicity and socioeconomic status, for example, have been found to amplify impacts from long- and short-term environmental exposures for several health outcomes,

[259] The figure represents the top and bottom decile scoring of CalEnviroScreen census tracts for pollution burden. This chart is modified from Figure 2. Race in the Least and Most Impacted Census Tracts of CalEnviroScreen 4.0 in the Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. 2021. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

[260] California Department of Public Health (CDPH). 2015. *The Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity.* A Report to the Legislature and the People of California by the Office of Health Equity. Sacramento, California. California Department of Public Health, Office of Health Equity.

such as mortality and birth outcomes.[261,262,263,264] Social factors combine in low-income communities and communities of color to create levels of toxic chronic stress and limit opportunities for healthy food and healthy lifestyles. Social factors also can cause health disparities through psychosocial pathways such as discrimination and social exclusion.[265] While the importance of social determinants is well known, measuring the specific and cumulative impacts of social determinants is challenging.

There are several important tools to evaluate and map cumulative impacts and factors contributing to the results of historical practices such as redlining, and these tools have been used for air quality and climate planning, community protection, and investments. CalEnviroScreen is a tool that maps cumulative pollution burdens and vulnerabilities on a statewide basis and ranks census tracts based on environmental, exposure, population, and socioeconomic indicators. An analysis using CES shows a direct, persistent relationship between exposure to environmental burdens and socioeconomic and health vulnerabilities affecting communities of color and historical redlining practices. OEHHA has evaluated health impacts of certain climate change policies on disadvantaged communities and communities of color utilizing CES rankings.[266] The Healthy Places Index (HPI) maps indicators that affect life expectancy on a statewide basis. In the future, these and other tools can be helpful to prioritizing investments and informing implementation efforts for GHG emission reductions policies.

Environmental Determinants of Health Inequities

Communities with large percentages of Black and other socially vulnerable and marginalized groups are disproportionately located near pollution sources, such as traffic

[261] O'Neill, M. S., M. Jerrett, I. Kawachi, J. I. Levy, A. J. Cohen, N. Gouveia, et al. 2003. "Health, wealth, and air pollution: Advancing theory and methods." *Environ Health Perspect.* 111 (16): 1861–70.
[262] Ponce, N. A., K. J. Hoggatt, M. Wilhelm, and B. Ritz. 2005. "Preterm birth: The interaction of traffic-related air pollution with economic hardship in Los Angeles neighborhoods." *Am J Epidemiol.* 162 (2): 140–8.
[263] Morello-Frosch, R., B. Jesdale, J. Sadd, and M. Pastor. 2010. "Ambient air pollution exposure and full-term birth weight in California." *Environ Health.* 9: 44.
[264] Finkelstein, M. M., M. Jerrett, P. DeLuca, N. Finkelstein, D. K. Verma, K. Chapman, et al. 2003. "Relation between income, air pollution, and mortality: A cohort study." *CMAJ.* 169 (5): 397–402.
[265] Clougherty, J., and L. Kubzansky. 2009. "A framework for examining social stress and susceptibility in air pollution and respiratory health." *Environ Health Perspect.* 117 (9): 1351–8.
[266] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities.* https://oehha.ca.gov/media/downloads/environmental-justice//impactsofghgpoliciesreport020322.pdf.

and freight facilities, industrial facilities, and hazardous waste sites.[267,268,269,270] Research shows large disparities in exposure to pollution between white and non-white populations in California, and between low-income and communities of color (Figure 3-13). The research also shows Black and Latino populations experience significantly greater air pollution impacts than white populations in California.[271] Additionally, Native Americans are disproportionately impacted by air pollution with high rates of exposure to industrial, diesel, and residential pollution sources and higher rates of diseases linked to air pollution.[272, 273]

[267] Mohai. P., P. M. Lanz, J. Morenoff, J. S. House, and R. P. Mero. 2009. "Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: Evidence from the Americans' Changing Lives Study." *Am J Public Health.* 99 (Suppl 3): S649–56.

[268] Mohai, P., and R. Saha. 2007. "Racial inequality in the distribution of hazardous waste: A national-level reassessment." *Soc Probl.* 54 (3): 343–70.

[269] Morello-Frosch, R., M. Pastor, C. Porras, and J. Sadd. 2002. "Environmental justice and regional inequality in southern California: Implications for future research." *Environ Health Perspect.* 110 (Suppl 2): 149–54.

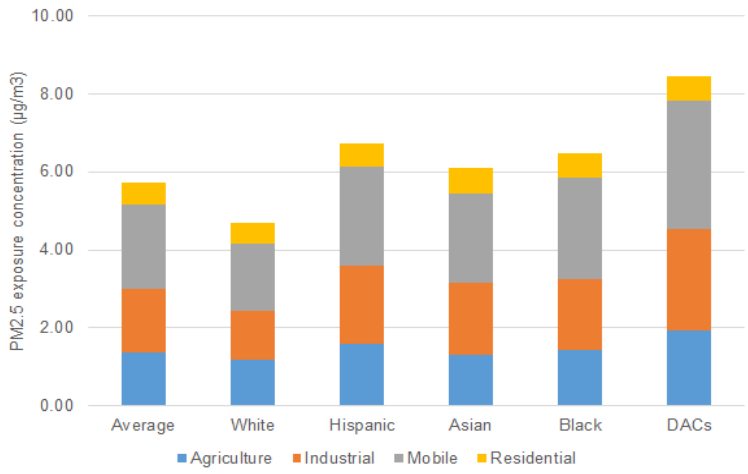
[270] Gunier, R. B., A. Hertz, J. von Behren, and P. Reynolds. 2003. "Traffic density in California: Socioeconomic and ethnic differences among potentially exposed children. *J Expo Anal Environ Epidemiol.* 13 (3): 240–6.

[271] Apte, J. S., S. E. Chambliss, C. W. Tessum, and J. D. Marshall. 2019. *A Method to Prioritize Sources for Reducing High $PM_{2.5}$ Exposures in Environmental Justice Communities in California.* CARB Research Contract Number 17RD006.

[272] Indigenous People and Air Pollution in the United States. A Report from the National Tribal Air Association and Moms Clean Air Force. 2021. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2021/04/indigenousairpollution_041421.pdf*

[273] National Tribal Air Association. 2022. Status of Tribal Air Report. Pg. 66. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2022/10/2022-NTAA-Status-of-Tribal-Air-Report.pdf*.

Figure 3-13: Top sources of $PM_{2.5}$ and their contribution to $PM_{2.5}$ exposures by race and in disadvantaged communities



These disparities in exposure to pollution sources generate health inequities. Communities located near major roadways are at increased risk of asthma attacks and other respiratory and cardiac effects. Studies consistently show that mobile source pollution exposure near major roadways or freight sources contributes to and exacerbates asthma, impairs lung function, and increases cardiovascular mortality.[274] The exposure to mixtures of gaseous and particulate pollutants in mobile sources (including PM, NO_x, and benzene) is associated with higher rates of heart attacks, strokes, lung cancer, autism, and dementia.[275]

Environmental hazards found in communities also can include exposures to toxic substances and emissions, as well as occupational exposures. Due to historical inequities, under-resourced communities and communities of color are often located close to sources of toxic pollution, including chrome platers; metal recycling facilities; oil and gas operations; agricultural burning; railyards; facilities transporting, managing, or disposing of hazardous waste; and areas impacted by pesticides, among others. Some populations may be at increased risk of exposure to pollutants, both at work and home.

Children are more susceptible to environmental pollutants for many reasons, including the ongoing development of their nervous, immune, digestive, and other bodily systems. Moreover, children eat more food, drink more fluids, and breathe more air relative to their

[274] U.S. Environmental Protection Agency website. How Mobile Source Pollution Effects Your Health. *https://www.epa.gov/mobile-source-pollution/how-mobile-source-pollution-affects-your-health*.
[275] USC Environmental Health Centers. 2018. Living Near Busy Roads or Traffic Pollution. *https://envhealthcenters.usc.edu/wp-content/uploads/2016/10/living-near-bus_19696172.pdf*.

body weight, as compared to adults.[276] Exposure to high levels of air pollutants, including indoor air pollutants, increases the risk of respiratory infections, heart disease, and asthma.[277] Children living in low-income communities near industrial operations, rail yards, and heavily trafficked freeways and streets in urban areas are at especially high risk of chronic respiratory conditions. Black children are four times more likely to be hospitalized for asthma compared with white children, and urban Black and Latino children are two to six times more likely to die from asthma than white children.[278] Native American children also experience more impacts from asthma and Native American children, along with Black children, have the highest prevalence of asthma.[279]

For older adults, increased vulnerability is linked to respiratory, cardiovascular, and immune systems weakened by aging.[280] Preexisting health conditions interact with environmental pollutants to enhance risks of adverse health outcomes.[281,282] The recent COVID-19 pandemic has highlighted the heightened vulnerability of older adults as well as communities of color to respiratory disease, as hospital admissions and mortality data linked to COVID-19 cases for these groups have been higher than other groups. Research has also underscored the important link between COVID-19 mortality and morbidity and air pollution, demonstrating significantly higher mortality and morbidity for COVID-19 in areas of elevated $PM_{2.5}$ pollution.

Climate Vulnerabilities

Climate change is expected to exacerbate the existing disparities of health conditions and worsen climate vulnerability, which is the degree to which natural systems and people or

[276] Blaisdell, R. J. Air Toxics Hot Spots Program Risk Assessment Guidelines. 2012. Technical Support Document for Exposure Assessment and Stochastic Analysis. Oakland, California: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. August.
[277] Woodruff, T. J., D. A. Axelrad, A. D. Kyle, O. Nweke, and G. G. Miller. 2003. *America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illness.* 2nd ed. Washington, D.C.: United States Environmental Protection Agency. February.
[278] California Department of Public Health. Asthma Inequities in California Children. 2021. *https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/CDPH%20Document%20Library/CA_Asthma_Inequities_Children_2021-Infographic.pdf*.
[279] Meng, Y., S. H. Babey, T. A. Hastert, and E. Brown. 2007. California's Racial and Ethnic Minorities More Adversely Affected by Asthma. UCLA: Center for Health Policy Research. Retrieved from *https://escholarship.org/uc/item/4k45v3xt*.
[280] Sandström, T., A. J. Frew, M. Svartengren, and G. Viegi. 2003. "The need for a focus on air pollution research in the elderly." *Eur Respir J Suppl.* 40: 92s–5s.
[281] Zanobetti, A., and J. Schwartz. 2001. "Are diabetics more susceptible to the health effects of airborne particles?" *Am J Respir Crit Care Med.* 164 (5): 831–3. *https://www.atsjournals.org/doi/pdf/10.1164/ajrccm.164.5.2012039*.
[282] Zanobetti, A., J. Schwartz, and D. Gold. 2000. "Are there sensitive subgroups for the effects of airborne particles?" *Environ Health Perspect.* 108 (9): 841–5.

communities are at risk of experiencing the negative impacts of climate change.[283] A report from the California Climate Change Center warned that the impacts of climate change will likely create especially heavy burdens on low-income and other vulnerable populations: "*Without proactive policies to address these equity concerns, climate change will likely reinforce and amplify current as well as future socioeconomic disparities, leaving low-income, minority, and politically marginalized groups with fewer economic opportunities and more environmental and health burdens*."[284]

In the U.S. Environmental Protection Agency's "Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts,"[285] investigators analyzed risks of six primary climate change impacts disproportionately affecting communities across income, educational attainment, race/ethnicity, and age groups. Four socially vulnerable populations—low income, communities of color, no high school diploma, and age 65 and older—were identified as having a higher likelihood of experiencing the greatest impacts of a changing climate (according to the projected 2°C of global warming or 50 centimeters of global sea level rise). Disproportionate impacts were projected for climate events, including air quality, extreme temperature, coastal flooding, and other impacts, leading to increased risk of health and other adverse outcomes. The study projected significant health impacts for low-income communities, certain racial and ethnic subgroups, and those with lower educational attainment.

Several climate vulnerability tools have been developed or are under development to better understand and map areas at higher risk of climate impacts. The Climate Change and Health Vulnerability Indicators (CCHVIs) for California helps state and local health officials prepare for and reduce adverse health impacts due to a changing climate.[286] For example, Los Angeles County shows higher than state average climate vulnerability overall, particularly for those who are linguistically isolated (more than twice the state average).

In summary, there are many environmental, social, individual, and economic factors affecting health and equity in California and contributing to worsening health outcomes from climate change impacts. This section and Appendix G (Public Health) reference a substantial and growing body of research documenting the different social and

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[283] OPR. 2018. Defining Vulnerable Communities in the Context of Climate Adaptation. *https://opr.ca.gov/docs/20180723-Vulnerable_Communities.pdf*.

[284] Shonkoff, S., R. Morello-Frosch, M. Pastor, and J. Sadd. 2011. "The climate gap: environmental health and equity implications of climate change and mitigation policies in California—A review of the literature." *Climatic Change* 109 (Suppl 1): S485–S503.

[285] U.S. EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency. EPA 430-R-21-003.

[286] CDPH. 2022. Climate Change and Health Vulnerability Indicators for California. California Department of Public Health. *https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx*.

environmental factors affecting health outcomes and the many groups that are vulnerable to increased effects or that experience health inequities in California (see Table 3-13).

Table 3-13: Examples of vulnerable groups due to socioeconomic, environmental, developmental, and climate change factors

Examples of Vulnerable Groups Due to Socioeconomic, Environmental, Developmental, and Climate Change Factors		
Older People	People with Existing Chronic Illness	People Impacted Due to Working Conditions
Tribal Groups	Infants and Children	Low-Income People
People with Disabilities	People Experiencing Homelessness	Pregnant People
Communities of Color	Marginalized People	Immigrants/Refugees
People with Less Educational Options	Linguistically Isolated Households	People Impacted Due to Poor Housing Conditions

Summary of the Qualitative Health Analysis

CARB has developed a detailed health analysis that covers eight social and environmental co-benefit areas that impact public health (listed below). These co-benefit areas were selected due to ongoing research in these areas as well as discussion in a public workshop on climate change and health impacts held in summer 2018. For each social and environmental area, the analysis includes:

- a discussion of health impacts and disparities,
- key health metrics or epidemiological research on this topic,
- a discussion of how these areas would be affected by "no-action" (i.e., Reference) scenario compared to a "take-action" (i.e., Scoping Plan) scenario
- a discussion of where there are actions to consider for further success, and
- the types of mitigation actions that can help reduce or eliminate disparities and promote greater health equity and resilience.

All co-benefit areas are interconnected, and pursuing benefits in all areas has the potential to multiply positive results and further support building community resilience. *Community resilience* is the ability of a community to reduce harm and maintain an acceptable quality of life in the face of climate-induced stresses, which vary depending on that community's circumstances and location. Below is a brief description of the areas evaluated for public health co-benefits. The specific health outcomes impacted by each

area, as well as the directional health benefits, are included in the Summary of Health Benefits section of the chapter and covered in more detail in Appendix G (Public Health).

Heat Impacts

Globally, increased GHG concentrations in the atmosphere are causing a continuing increase of the planet's average temperature. California temperatures have risen since records began in 1895, and the rate of increase is accelerating. Recent heat waves have broken heat records and caused serious illness across the state, and these events are becoming more frequent. Heat waves have a particularly high impact in Southern California, where they have become more intense and longer lasting. In the past two years, Los Angeles recorded 121°F, and the Coachella Valley had its hottest year ever, with temperatures reaching 123°F. Heat island effects in urbanized areas can elevate heat effects and disproportionately affect low-income communities and communities of color. Heat events exacerbate respiratory and cardiac illness and cause emergency room visits to soar. Strategies that reduce the impacts of heat exposure promote improved health outcomes.

Wildfires and Smoke

California's NWL cover more than 90 percent of California and include rangeland, forests, woodlands, grasslands, and urban green space. They provide biodiversity and ecosystem benefits, including their ability to sequester carbon from the atmosphere. Protecting and managing California's forests and other natural lands and maintaining their ecosystem health are key practices for maximizing GHG benefits and minimizing negative climate change impacts. Vegetation plays an important role in storing carbon; however, it can also release CO_2 back into the atmosphere when it dies or is burned by fires. California's wildfires are getting worse with increased fire risks, higher frequency of occurrence, larger burn areas, more costly damage, and a longer fire season due to climate change. Strategies that promote healthy ecosystem management of natural and working lands and increased urban greening promote improved health outcomes. Healthy ecosystems provide many health and environmental benefits and can maximize carbon sequestration.

Children's Health and Development

There are a wide range of interconnected environmental, social, biological, and community factors associated with climate change that are adversely affecting children's health. This section focuses on air pollution and near-roadway or traffic pollution as environmental impacts that have a profound effect on children's health. Children's bodies and lungs are still developing, and they take in more air per body weight than adults do. Many low-income communities and communities of color in California experience disproportionately high levels of air pollution, as well as high levels of traffic and freight that impact children. This excess exposure harms children's development and

predisposes them to increased risk of illness throughout their lives. Strategies that reduce air pollution and traffic emissions promote improved health outcomes for children.

Economic Security

Climate change is expected to result in serious adverse socioeconomic effects across many sectors. Economic factors, such as income inequality (among geographic regions), poverty, wealth, debt, unemployment rate, and job security are among the strongest determinants of health. Along the entire income spectrum, higher income is associated with increased life expectancy and improved health outcomes in the United States. Additionally, economic insecurity and negative health impacts are more pronounced in low-income communities and communities of color. Economic strategies, such as the promotion of clean energy and other green jobs and investments in low-income communities and communities of color, and promoting a transition to high road jobs in economic sectors tied to the current fossil fuel economy, can promote improved health outcomes.[287]

Food Security

The food system is under pressure from numerous factors, and climate change is a key concern. Climate change can affect food production and agricultural yield, impact culturally significant plants and animals for Native American tribes, and exacerbate factors that limit food availability, such as supply chain disruption. Food security is defined as stable access to affordable, sufficient food for an active, healthy life. Many Californians routinely experience food insecurity, and while that impacts Californians of all races and groups, low-income communities and communities of color and children are disproportionately affected by food insecurity. Many Native Americans depend on resources from the land, such as animals and plants for consumption and cultural practices. Strategies that promote sustainable agriculture, access to healthy foods, and reduced organic food waste promote improved health outcomes.

Mobility and Physical Activity

Physical activity is one of the most important factors for a healthy lifestyle, and lack of activity increases the risk of chronic illness and premature death. Research shows that regular physical activity improves health in people of all ages by improving heart and lung

[287] According to the California Labor and Workforce Development Agency's High Road Training Partnership program, high road jobs are considered "Quality jobs [that] provide family-sustaining wages, health benefits, a pension, worker advancement opportunities, and collective worker input and are stable, predictable, safe and free of discrimination." *https://cwdb.ca.gov/wp-content/uploads/sites/43/2020/08/OneSheet_Job-Quality_ACCESSIBLE.pdf*.

function, muscle fitness, mental health and brain function, and sleep quality. A sedentary lifestyle contributes to chronic illnesses, including obesity, heart disease, and Type 2 diabetes among other chronic illnesses. Promoting community design that supports sustainable patterns of land use and transportation enables active transportation choices like walking, biking, and public transit over driving, and can significantly increase physical activity, leading to many valuable health benefits.

Affordable Housing

Housing is an important social determinant of health. The stability of housing, housing quality, conditions inside and outside the home, the cost of housing, and the environmental and social characteristics of the places people live all affect health (including energy efficiency and insulation, cooler building material, tree canopy, home size). Housing affordability is a key factor, and this section highlights how housing affordability supports not only improved health but also more sustainable land use and transportation patterns. A lack of affordable housing is increasing commute distances for low-income renters and creating health burdens. Strategies that support sustainable transportation and housing patterns, together with increased housing affordability, promote improved health outcomes.

Urban Greening

Urban Greening is well recognized as an important amenity, but the inherent health benefits are not always well understood. Under-resourced and vulnerable areas consistently show a lack of urban greening and higher percentages of concrete, asphalt, and impervious surfaces. Under-resourced communities have a greater proportion of concrete and heat-trapping surfaces and a lower amount of tree cover in the neighborhoods in which they live. Areas with reduced urban greening have the potential to create areas of higher temperatures as heat is reflected from pavements and buildings. By contrast, increasing urban greening can provide air pollution buffers and promote physical activity. Strategies that preserve and create urban parks, green space, natural infrastructure, and sustainable agricultural practices support improved physical and mental health outcomes.

No Action Scenario (Reference)

In a no-action scenario, California would remain dependent on fossil fuels and other GHG emitting technologies. Fossil-fuel powered mobile sources including cars, trucks, trains, tractors, and a myriad of other on-road and off-road vehicles and equipment are the largest source of criteria pollutants and toxic air contaminants that directly affect

community health and contribute the largest portion of GHG emissions.[288] Other key GHG emission sources include buildings, natural and working lands, and power production and industry. The no-action scenario reflects a continued reliance on fossil fuels in mobile and stationary sectors, including buildings. The continued production and use of fossil fuels; ongoing dependence on gasoline and diesel cars, trucks, buses, and equipment; continued releases of short-lived climate pollutants; and decreased emphasis on forest and ecosystem health will impact communities by reducing climate resilience and health benefits. Green space will likely remain at the same levels or degrade, and urban heat islands will likely increase. With continued growth of vehicle miles traveled, physical activity and the accompanying health benefits will not increase.

Exposure to wildfire smoke will increase, and air quality is expected to worsen as rising temperatures will increase levels of harmful air pollution. Jobs and economic security will be affected by the continuing potential for price spikes in fossil fuels, impacts to the economy from climate change, and fewer job opportunities in green technologies such as solar and electric vehicles. Food security in California will decrease due to the effects of accelerating climate impacts to agriculture; and without increased recovery of organic waste, including food products, food security will continue to decline under a no action scenario. All these impacts can be linked to worse health outcomes. Adverse health impacts are often most felt by Black, Latino, Native American, and other people of color and in low-income communities. These groups are affected more intensely by the physical stress of environmental pollution, social inequities, and the psychological stress of extreme weather events and food and economic insecurity.

Take Action Scenario

In the Take Action scenario, California will drastically reduce reliance on fossil fuels for motor vehicles, freight, buildings, electricity, or other sectors. This scenario is not a specific scenario within this Scoping Plan but examines the broad outcomes of actions to achieve carbon neutrality in 2045. Implementation of this Scoping Plan would achieve a transition to ZEVs, with 100% sales of light-duty ZEVs by 2035 and 100% sales of zero emission trucks by 2040, along with 30% VMT reductions below 2019 levels by 2045. State and local action that supports sustainable land use and transportation patterns and enables more transit and active transportation will lead to substantial health benefits from physical activity, including reduced illness and deaths.

[288] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*.

The economic benefits of improved health through active transportation can be modeled using the Healthy Mobility Options Tool (HMOT).[289] In order to demonstrate the important health and economic benefits of VMT reduction, CARB and CDPH used the HMOT to analyze an illustrative trip reduction scenario for 2050 from the California Transportation Plan (CTP). The CTP has a goal of increasing active modes of travel and transit from the current level of 13 percent to a level of 23 percent of all travel trips. While the CTP goal of 23 percent for active modes of travel is not a VMT reduction target, the scenario increases active transportation through a mix of changes in land use planning for increased transportation options, including increases in biking, walking, and transit use, and it helps to show the health benefits of increased active transportation. By achieving the CTP 2050 goals, nearly 8,000 deaths would be avoided in 2050 alone (see Figure 3-14), along with significant reductions in chronic diseases. Achieving this would rank among the top public health accomplishments (see Appendix G [Public Health] for additional modeling results and detailed discussion).

The dramatic reduction in fossil fuel combustion, combined with reductions in VMT and freight and traffic emissions projected in this Scoping Plan will significantly reduce air pollution and its associated health impacts on a statewide basis and in communities near freight sources. Coordinated action strategies will emphasize natural and working lands management changes, including healthy forests, increased vegetative cover, and increased organic farming. Wildfire smoke exposure will reduce significantly with healthy ecosystem management strategies. Since many communities in California are disproportionately impacted by high levels of traffic pollution, the reduction in petroleum fueled vehicles will reduce the additional impacts of living or going to school near historically highly polluting sources. Indoor air quality is also likely to improve through a shift to non-fossil fuel appliances. Concerted state and local action to support sustainable land use and transportation patterns can enable more active transportation with health benefits from physical activity.

[289] ITHIM California. 2020. Transportation Planning for Health, Equity, and Climate Change. *https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/*.

Figure 3-14: Quantified health benefits of active transportation from increased physical activity



*Calculated by the Healthy Mobility Options Tool, active transportation (including walking, rolling, cycling, and taking public transit) from the California Transportation Plan 2050 compared to business as usual for 2050.

Overall community resilience is expected to increase as physical activity and green space increases—potentially decreasing urban heat islands. Efforts to support VMT reduction will include coordination across state agencies on affordable housing measures. Reduced fossil fuel dependence will reduce economic pressure from wildfires, droughts, and price spikes in fossil fuels, especially as more jurisdictions implement plans with similar actions. Investment in sustainable agriculture, healthy forests, urban greening, and clean energy technologies will add sustainable jobs and further promote economic security. More sustainable agriculture and food recovery efforts will add to food security. All these impacts can be linked to wide ranging health benefits, including positive respiratory and cardiovascular effects, healthier birth and brain outcomes, improved mental health indicators, improved life expectancy, reductions in chronic illness and cancers, improved children's health and development, reduced depression, and other benefits. The magnitude of the possible co-benefits is extremely large, especially in areas that are currently the most affected.

Summary of Health Benefits

Below, Tables 3-14 and 3-15 show overall summaries of the directional benefits by co-benefit area estimated for this Scoping Plan. The supporting epidemiological studies used for qualitative or quantitative analysis of each co-benefit area are included in Appendix G (Public Health). Another section of Chapter 3, together with Appendix C (AB 197 Measure Analysis) and Appendix H (AB 32 GHG Inventory Sector Modeling), also includes the quantitative analysis of air pollution related health impacts, including recently added health endpoints for CARB's ongoing analysis.

Table 3-14: Scoping Plan directional benefits for health co-benefit areas (heat, affordable housing, food security, economic security, and urban greening)

Health Co-benefit Areas*					
Quantitative vs. Qualitative	**Reduced Heat Impacts**	**Increased Affordable Housing**	**Increased Food Security**	**Increased Economic Security**	**Increased Urban Greening**
Research was used for Qualitative Analysis	↓ Mortality ↓ Emergency Room Visits for cardiovascular and respiratory causes and intestinal infections ↓Hospitalization for cardiovascular, respiratory causes ↓ Preterm Birth ↓ Mental Illness	↓ Infectious Disease ↓ Chronic Illness ↓ Asthma ↓ Injuries ↓ Mental Illness ↑ Children's Performance in Schools ↑ Children's Health ↓ Children's Behavioral Problems	↓ Mental Illness ↓ Iron Deficiency ↓ Chronic Diseases ↑ Life Expectancy ↓ Children's Mental Illness ↓ Children's Cognitive Problems ↓ Children's Behavioral Health Problems ↓ Children's Iron Deficiency ↓ Children's Oral Health Problems	↑ Life Expectancy ↑ Health Status ↑ Mental Health	↓ Mortality ↓ Asthma Prevalence ↓ Depression ↓ Adverse Birth Outcomes including low birth weight and small for gestational age ↑ Life Expectancy

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

Table 3-15: Scoping Plan directional benefits for health co-benefit areas (traffic pollution, wildfire, and active transportation)

Health Co-benefit Areas*			
Quantitative vs. Qualitative	**Reduced Traffic Pollution**	**Reduced Wildfire Smoke**	**Increased Active Transportation**
Research was used for Quantitative Analysis	↓ Children's Respiratory Outcomes, Hospital Admissions ↓ Children's Respiratory Outcomes, Emergency Room Visits ↓ Children's Asthma Onset ↓ Children's Asthma Symptoms	↓ All-Cause Mortality ↓ Asthma, Hospital Admissions ↓ COPD, Hospital Admissions ↓ All Respiratory Outcomes, Hospital Admissions ↓ Asthma, Emergency Room Visits ↓ All Respiratory Outcomes, Emergency Room Visits ↓ All Cardiac Outcomes, Emergency Room Visits	↓ Cardiovascular Diseases ↓ Colon Cancer ↓ Breast Cancer ↓ Diabetes ↓ Dementia ↓ Lung Cancer ↓ Respiratory Disease ↓ Depression ↑ Traffic Accidents
Research was used for Qualitative Analysis	↑ Children's Lung Function Growth ↓ Children's Bronchitic Symptoms ↓ Children's Impaired Cognitive Development ↓ Children's Adverse Birth Outcomes, including low birth weight and preterm birth		

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

In summary, the qualitative health analysis of the No-Action versus Take-Action scenarios for this Scoping Plan shows an overwhelming benefit for the state by taking action to move forward to carbon neutrality while continuing efforts to increase health equity and resilience in individual communities. Taking action can improve physical and mental health for adults and children, reduce a range of chronic illnesses, and promote improvements in life expectancy. Development and implementation of actions to achieve the outcomes called for in this Scoping Plan should consider how to engage affected communities in implementation, address the existing health and opportunity gaps, and pursue equitable implementation statewide and locally. This Scoping Plan deployment of clean technology and fuels, together with improved land management, will reduce GHGs and air pollution and create more resilient communities that are better able to prepare for and recover from extreme climate events.

Environmental Analysis

In May 2022, CARB, as the lead agency for the Scoping Plan, released for public review the Draft Environmental Analysis (Draft EA) for this Scoping Plan; it assessed the potential environmental impacts of implementing the Scoping Plan. CARB circulated the Draft EA for public review and comment for a period of 45 days that began on May 10, 2022, and ended on June 24, 2022. CARB held a public hearing on June 23, 2022 to provide the opportunity for public comment. During the review period, written and oral comments were received on the Draft EA. CARB reviewed the comments to identify environmental topics and began preparation of responses to those comments.

After the end of the Draft EA public review period, CARB identified potential revisions to certain aspects of this Scoping Plan that merit revisions to the project description. This new information results from, among other things, revisions to the project description regarding energy sector goals (including offshore wind), revised carbon removal targets, and additional strategies for natural and working lands. CARB released a Recirculated Draft EA for a written public comment period that started September 9, 2022, and ended on October 24, 2022. See Chapter 2 of the Recirculated Draft EA[290] for further information regarding the changes. The Recirculated Draft EA assesses the potential for significant adverse and beneficial environmental impacts associated with all proposed actions in this Scoping Plan, and provides a programmatic environmental analysis of the reasonably foreseeable compliance responses that could result from implementation of the Scoping

[290] CARB. 2022. Recirculated Draft EA. *https://ww2.arb.ca.gov/sites/default/files/2022-09/2022-draft-sp-appendix-b-draft-ea-recirc.pdf*.

Plan.[291] The Recirculated Draft EA concluded implementation of this Scoping Plan could result in the following:

- Beneficial impacts to: air quality (long-term operational-related) and GHG emissions (short-term construction-related and long-term operational-related)
- Less than significant impacts to: energy demand, mineral resources, population and housing, public services, recreation (short-term construction-related), and wildfire (short-term construction-related)
- Potentially significant and unavoidable adverse impacts to: aesthetics, agriculture and forest resources, air quality (construction-related and operational odors), biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, recreation (long-term operational-related), transportation and traffic, tribal cultural resources, utilities and service systems, and wildfire (long-term operational-related

Before the public meeting at which the Board will consider this Scoping Plan Update, CARB will publish the Final EA as Appendix B (Final Environmental Analysis) to this Scoping Plan, along with written responses to timely submitted comments raising significant environmental issues received on the Draft EA and the Recirculated Draft EA, which will be presented to the Board for consideration.

[291] The Recirculated Draft EA is available at *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents*.

Chapter 4: Key Sectors

Chapter 4 provides an overview of the major energy sources and technology in use today, and of alternative clean technology and fuels to support decarbonization based on the latest information available. Every sector of the economy will need to begin to transition in this decade to meet our GHG reduction goals and achieve carbon neutrality no later than 2045. AB 32 requires climate change mitigation policies to be considered in the context of the sector's contribution to the state's total GHG emissions. The transportation, electricity (in-state and imported), and industrial sectors are the largest contributors of GHGs in the state and present the largest opportunities for GHG reductions. Actions to reduce fossil fuel combustion in these sectors also can provide critical air pollution reductions in low-income communities and communities of color, which are often located adjacent to these sources. A carbon neutrality framework also elevates the role of CO_2 removal through natural and working lands and mechanical capture and storage. Actions that support energy efficiency, reduced VMT, alternative fuels, and renewable power also can provide benefits by reducing both criteria and toxic air pollutants.

What sets this plan apart from previous Scoping Plans is the focus on the accelerated rate of deployment of clean technology and energy within every sector. As a result, specific actions, including accelerated rates of deployment of clean technology and fuels identified within this Scoping Plan, will need to be translated into both new and amended regulations, policies, and incentive programs. State agencies will need to evaluate current authority to align existing policies or develop new ones to achieve outcomes called for in this Scoping Plan. Legislative support may be needed in some cases to ensure authority and funding is sufficient to ensure this Scoping Plan is translatable to action on the ground. Most regulations, or change to existing regulations, ultimately considered by the Board or other state agencies for adoption will be subject to administrative procedure requirements. Accordingly, they must rely on specific subsequent supporting analysis and extensive public processes and consultations with interested tribes to develop and identify appropriate proposals for effective implementation. For example, any proposal to strengthen the LCFS regulations through amendments increasing the stringency of the carbon intensity (CI) targets would be considered on the basis of a public process, including workshops, and focused environmental, economic, and public health analyses.

Policies that ensure economy-wide investment or program decisions that incorporate consideration of GHG emissions are particularly important. As we pursue GHG reduction targets, we must acknowledge the manner in which built and natural environments are connected, how changes in one may impact the other, and how policy choices in one sector can and do impact other sectors. For example, fostering more compact, transportation-efficient development in infill areas and increasing transportation choices with the goal of reducing VMT not only reduces demand for transportation fuel but also requires less energy for buildings and helps to conserve natural and working lands that

sequester carbon. Therefore, the multiple and often interwoven actions that reduce VMT both reduce emissions from the transportation sector and support reductions needed in other sectors.

Legislation, such as SB 350[292] (De León and Leno, Chapter 457, Statutes of 2015), has recognized the need for CARB, the CEC, and the CPUC to work together to ensure the state's energy and climate goals are integrated in procurement decisions by load serving entities as part of Integrated Resource Plans. Moving forward, it is especially critical that similar approaches are adopted to break down silos across state agencies to ensure policies and programs are aligned with multiple state priorities outlined in this plan. Finally, supportive legislative direction, such as SB 905 that requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program, may also benefit emerging areas of policy to provide express agency authority and roles for these nascent efforts, including streamlining of permitting, while ensuring that protections for communities are in place.

Unlike previous Scoping Plans that separated out individual economic sectors, this Scoping Plan approaches decarbonization from two perspectives: (1) managing a phasedown of existing energy sources and technology and (2) ramping up, developing, and deploying alternative clean energy sources and technology over time. This approach supports a more comprehensive consideration of our energy infrastructure, the ability to repurpose existing assets, and the need to build new assets. It also provides multiple metrics beyond just the annual AB 32 GHG Inventory to better enable tracking progress. For example, it clearly demonstrates the production and distribution rates of specific types of clean energy, such as adding 4.3 GW of utility solar and 2.5 GW of storage year-over-year between now and 2035 to be on track to achieve carbon neutrality no later than 2045, and does the same for technology deployment, such as 11 million ZEVs in 2035.

The sections below include key actions to support success in the necessary transition away from fossil combustion, which is an overriding goal of this plan. The wide array of complementary and supporting actions being contemplated or to be undertaken across state government are detailed here. The broad view of actions described in this chapter thus provides context for the specific deployment of clean technology and fuels identified in the Scoping Plan Scenario described in Chapter 2. Actions identified in this Scoping Plan are based on currently known options and the latest science. As part of future Scoping Plan updates, additional clean technology and fuels may be identified and added to the mix of needed tools to continue to reduce the state's GHG emissions, support air quality co-benefits, and remove carbon from the atmosphere.

[292] California Air Resources Board. SB 350 Electricity Sector Greenhouse Gas Planning Targets. *https://ww2.arb.ca.gov/our-work/programs/sb350*.

Transportation Sustainability

The transportation sector has long relied on liquid petroleum fuels as the primary energy source for internal combustion engine (ICE) vehicles, including cars, trucks, locomotives, marine equipment, and aircraft. Combustion of fossil fuels in vehicles emits significant amounts of GHGs, criteria pollutants, and toxic air contaminants. In 2019,[293] the transportation sector accounted for approximately 50 percent of statewide GHG emissions[294] and thus was by far the single largest source of carbon pollution in the state. In addition, the transportation sector accounted for over 80 percent of statewide NOx emissions and 30% of fine particulate matter emissions, including toxic diesel particulate matter.[295]

Communities adjacent to congested roadways, including ports and distribution centers, are exposed to the highest concentration of toxic pollutants from vehicles and equipment consuming fossil fuels, leading to a number of demonstrated health impacts such as respiratory illnesses, higher likelihood of cancer development, and premature death. In addition, communities located near oil extraction operations or crude oil refineries often experience higher exposure to poor air quality. While CARB's programs, along with local action, have made substantial progress over the past few decades, it is clear that California must transition away from fossil fuels to zero-emission technologies with all possible speed and pursue policies that result in less driving, in order to meet our GHG and air quality targets.

The transportation sector can be divided into three general categories: Technology, Fuels, and Vehicle Miles Traveled.

- *Technology* refers to the vehicles themselves, as well as the associated refueling infrastructure for those vehicles.
- *Fuels* refers to the energy source used to power vehicles and the facilities that produce them.
- Vehicle travel is measured as *vehicle miles traveled* (VMT), and is a product of development patterns and available transportation options.

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[293] In 2020 the state experienced shelter-in-place orders in response to the COVID-19 pandemic. The orders, and the effects of the pandemic, led to a significant year-over-year decline in transportation emissions in 2020. This means 2019 is likely a more representative year for overall transportation emissions and 2020 a likely outlier in the historical transportation emissions trend data.
[294] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*. This includes upstream oil extraction and refining emissions.
[295] CARB. California Greenhouse Gas Emission Inventory Program. *https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program*.

Sector Transition

Technology

Vehicles must transition to zero emission technology to decarbonize the transportation sector. Executive Order N-79-20[296] reflects the urgency of transitioning to zero emission vehicles (ZEVs) by establishing target dates for reaching 100 percent ZEV sales or fleet transitions to ZEV technology. The primary ZEV technologies available today are battery-electric and hydrogen fuel cell electric vehicles (FCEVs), both of which emit zero tailpipe GHGs, criteria pollutants, and toxic air contaminants, as they do not burn fuel. These vehicles are rapidly growing in performance, affordability, and popularity.[297] Plug-in hybrid electric vehicles also offer a limited but increasing range of zero emission operation and will play a role in the transition to ZEVs.

Light-duty passenger vehicles consume the majority of gasoline in the state—12.9 billion gallons in 2019[298]—and are well-suited for transitioning to ZEVs. EO N-79-20 calls for 100 percent ZEV sales of new light-duty vehicles by 2035, and this target is reflected in this Scoping Plan.[299] The Advanced Clean Cars II regulation fulfills the goal in the Executive Order and serves as the primary mechanism to help deploy ZEVs. A number of existing incentive programs also support this transition, including the Clean Cars 4 All Program.[300] Heavy-duty trucks are the largest source of diesel particulate matter, a toxic air contaminant that is directly linked to a number of adverse health impacts, and EO N-79-20 also sets targets for transitioning the medium- and heavy-duty fleet to zero emissions: by 2035 for drayage trucks and by 2045 for buses and heavy-duty long-haul trucks where feasible. Replacing heavy-duty vehicles with ZEV technology will significantly reduce GHG emissions and diesel PM emissions in low-income communities and communities of color adjacent to ports, distribution centers, and highways. The existing Advanced Clean Trucks regulation, paired with the proposed Advanced Clean Fleets regulation, are designed to transition a significant amount of the

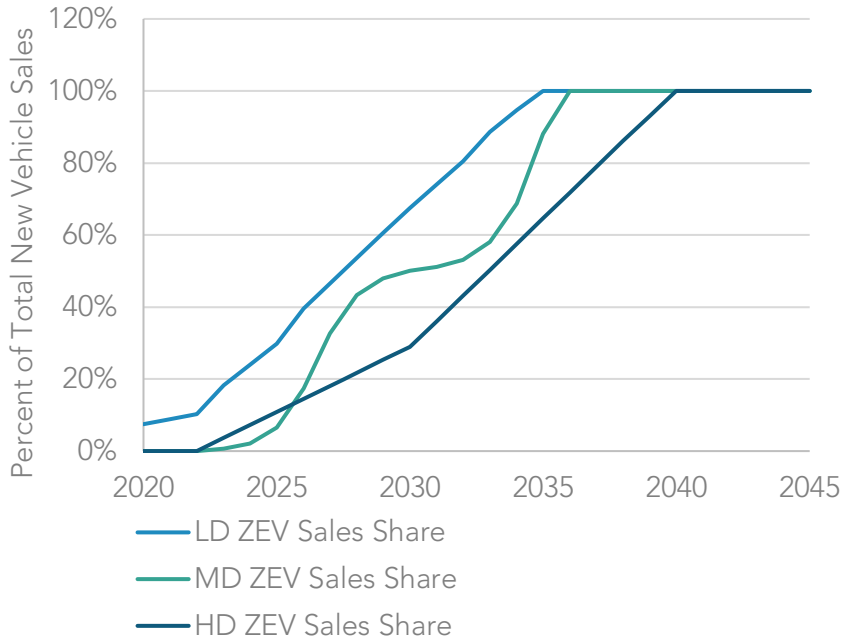
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[296] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf*.
[297] CARB. 2021. Public Workshop for Advanced Clean Cars II. May 6. *https://ww2.arb.ca.gov/sites/default/files/2021-05/acc2_workshop_slides_may062021_ac.pdf*.
[298] CARB. 2022. *Fuel Activity for California's Greenhouse Gas Inventory by Sector and Activity. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/fuel_activity_inventory_by_sector_all_00-20.xlsx*.
[299] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A, with reference to the date at which all new vehicle sales are ZEVs. *finalejacrecs.pdf (arb.ca.gov)*.
[300] CARB. Clean Cars 4 All. *https://ww2.arb.ca.gov/our-work/programs/clean-cars-4-all*. The Clean Vehicle Rebate Project (CVRP) also supports the transition to ZEVs. *https://cleanvehiclerebate.org/en*.

California truck fleet to ZEV technology. As with the LDV sector, a number of incentive programs support this transition, such as the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).[301]

Figure 4-1 below illustrates the pace of transition in vehicle technology needed to drastically reduce GHG emissions from vehicles. All vehicle classes reach 100 percent ZEV sales before 2045, with some achieving this well before. The ZEV technology across the vehicle classes is assumed to be primarily battery electric and hydrogen fuel cell (reflecting the primary ZEV technologies available today).[302]

Figure 4-1: Transition of on-road vehicle sales to ZEV technology in the Scoping Plan Scenario



Today, off-road vehicles also rely heavily on ICE technology. Executive Order N-79-20 sets an off-road equipment target of transitioning the entire fleet to ZEV technology by 2035, where feasible. There is a great need for both investment and innovation in the off-road space in order to develop and commercialize zero emission equipment types that meet or exceed the performance of existing equipment. A number of funding sources currently support this transition, including programs such as FARMER, Carl Moyer, and

[301] California HVIP. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project. https://californiahvip.org/?msclkid=efaf65f2c26f11eca6bdd08ecc323864.

[302] The light-duty fleet includes more than 11 million battery electric and hydrogen fuel cell vehicles in 2035 and over 23 million battery electric and hydrogen fuel cell vehicles in 2045.

the Community Air Protection Incentives—as well as Low Carbon Transportation Incentives, including the Clean Off-Road Equipment (CORE) program. In addition, the 2021–22 California budget provided record-high allocations for funding ZEVs, including off-road equipment, and the 2022–23 budget is similarly ambitious.[303] Several regulations focused on transitioning to zero emission off-road equipment have recently been adopted or are in the works, and apply to locomotives,[304] forklifts, ocean-going vessels at berth,[305] commercial harbor craft,[306] small off-road engines,[307] and more.

Intrastate aviation relies on ICE technology today, but battery-electric and hydrogen fuel cell aviation applications are in development, along with sustainable aviation fuel. The Scoping Plan Scenario includes a transition of 20% of aviation fuel demand to ZEV technologies by 2045 and sustainable aviation fuel for the rest.

Refueling infrastructure is a crucial component of transforming transportation technology. Electric vehicle chargers and hydrogen refueling stations must become easily accessible for all drivers to support a wholesale transition to ZEV technology. Deployment of ZEV refueling infrastructure is currently supported by a number of existing local and state public funding mechanisms, the new National Electric Vehicle Infrastructure (NEVI) federal funding mechanism, California's electric utilities, the Electrify America initiative that was established in response the Volkswagen ZEV commitment, and by numerous companies, such as EVgo, ChargePoint, Tesla, Ford, FirstElement Fuel, Chevron, Shell, and Iwatani, who are investing substantial private resources into developing these networks. Private investment in reliable, affordable and ubiquitous refueling infrastructure must drive the transition as the business case for ZEVs continues to strengthen.

Strategies for Achieving Success

- Achieve 100 percent ZEV sales of light-duty vehicles by 2035[308] and medium-heavy-duty vehicles by 2040.
- Achieve a 20% zero emission target for the aviation sector.

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[303] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. CARB and the Administration are committed to increasing focus on transportation equity investment as was reflected in the governor's 2022–23 budget. *finalejacrecs.pdf (arb.ca.gov)*.
[304] CARB. Reducing Rail Emissions in California. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*.
[305] CARB. Ocean-Going Vessels At Berth Regulation. *https://ww2.arb.ca.gov/our-work/programs/ocean-going-vessels-berth-regulation*.
[306] CARB. CARB passes amendments to commercial harbor craft regulation. *https://ww2.arb.ca.gov/news/carb-passes-amendments-commercial-harbor-craft-regulation*.
[307] CARB. Small Off-Road Engines (SORE). *https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore*.
[308] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A. *finalejacrecs.pdf (arb.ca.gov)*.

- Develop a rapid and robust network of ZEV refueling infrastructure to support the needed transition to ZEVs.
- Ensure that the transition to ZEV technology is affordable for low-income households and communities of color, and meets the needs of communities and small businesses.[309]
- Prioritize incentive funding for heavy-duty ZEV technology deployment in regions of the state with the highest concentrations of harmful criteria and toxic air contaminant emissions.[310]
- Promote private investment in the transition to ZEV technology, undergirded by regulatory certainty such as infrastructure credits in the Low Carbon Fuel Standard for hydrogen and electricity[311] and hydrogen station grants from the CEC's Clean Transportation Program[312] pursuant to Executive Order B-48-18.[313]
- Evaluate and continue to offer incentives similar to those through FARMER,[314] Carl Moyer,[315] the Clean Fuel Reward Program,[316] the Community Air Protection Program,[317] and Low Carbon Transportation,[318] including CORE.[319] Where feasible, prioritize and increase funding for clean transportation equity programs.[320]
- Continue and accelerate funding support for zero emission vehicles and refueling infrastructure through 2030 to ensure the rapid transformation of the transportation sector.

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[309] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF6, in the context of communities. *finalejacrecs.pdf (arb.ca.gov)*.
[310] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF7. *finalejacrecs.pdf (arb.ca.gov)*.
[311] CARB. LCFS ZEV Infrastructure Crediting. *https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting*.
[312] CEC. Clean Transportation Program. *https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program*.
[313] EO B-48-18 calls for 200 hydrogen refueling stations by 2025. *https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-48-18.pdf*.
[314] CARB. FARMER program. *https://ww2.arb.ca.gov/our-work/programs/farmer-program*.
[315] CARB. Carl Moyer program. *https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program*.
[316] California Clean Fuel Reward Program. *https://cleanfuelreward.com/*.
[317] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.
[318] CARB. Low Carbon Transportation Investments and Air Quality Improvement Program. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program*.
[319] Clean Off-Road Equipment (CORE) Voucher Incentive Program. *https://californiacore.org/*.
[320] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. *finalejacrecs.pdf (arb.ca.gov)*.

- Evaluate and align with this Scoping Plan relevant CARB policies such as Advanced Clean Cars II,[321] Innovative Clean Transit,[322] Zero Emission Airport Shuttle,[323] California Phase 2 GHG Standards,[324] Advanced Clean Trucks, Advanced Clean Fleets, Zero Emission Forklifts,[325] In-use Locomotives,[326] the Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, In-use Off-Road Diesel-Fueled Fleets Regulation,[327] Commercial Harbor Craft,[328] Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, Amendments to the In-use Off-Road Diesel-Fueled Fleets Regulation,[329] carbon pricing through the Cap-and-Trade Program,[330] and the Low Carbon Fuel Standard.[331]
- Identify and address permitting and market barriers to successful rapid ZEV technology deployment while protecting public health and the environment.

Fuels

Transitioning away from conventional ICE vehicles is part of the solution, but we must ensure that an adequate supply of zero-carbon alternative fuel and distribution is available to power these vehicles. Electricity and hydrogen are currently the primary fuels for ZEVs,

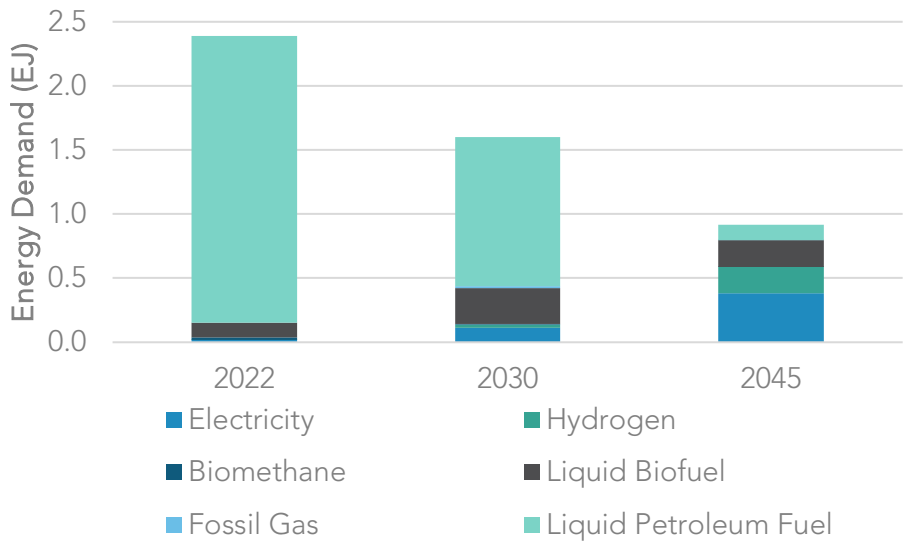
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[321] CARB. Advanced Clean Cars Program. *https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program*. Cal. Code Regs., tit. 13, §§ 1900, 1961.2, 1961.3, 1961.4, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, 2317, 2903.
[322] CARB. Innovative Clean Transit. *https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit*. Cal. Code Regs., tit. 13, §§ 2023—2023.11.
[323] CARB. Zero-Emission Airport Shuttle. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-shuttle*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[324] CARB. California Phase 2 Greenhouse Gas Standards. *https://ww2.arb.ca.gov/our-work/programs/greenhouse-gas-standards-medium-and-heavy-duty-engines-and-vehicles/phase2*. Cal. Code Regs., tit. 13, §§ 1956.8 and 2036; and Cal. Code Regs., tit. 17, §§ 95301, 95302, 95303, and 95663.
[325] CARB. Zero-Emission Forklifts. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-forklifts*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[326] CARB. Reducing Rail Emissions. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*. Proposed Cal. Code Regs., tit. 13, §§ 2478—2478.16.
[327] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*. Cal. Code Regs., tit. 13, §§ 2449, 2449.1, 2449.2.
[328] CARB. Commercial Harbor Craft. *https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft*. Cal. Code Regs., tit. 13, § 2299.5.
[329] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*.
[330] CARB. Cap-and-Trade Program. *https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program*. Cal. Code Regs., tit. 17, §§ 95801 et seq.
[331] CARB. Low Carbon Fuel Standard. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard*. Cal. Code Regs., tit. 17, §§ 95480 et seq.

and both fuels must be produced using low-carbon technology and feedstocks to minimize upstream emissions.

The transition to complete ZEV technology will not happen overnight. Conventional ICE vehicles from legacy fleets will remain on the road for some time, even after all new vehicle sales have transitioned to ZEV technology. In addition, some equipment types are only now in the initial stages of development of ZEV technology for propulsion, such as commercial aircraft or ocean-going vessels. In addition to building the production and distribution infrastructure for zero-carbon fuels, the state must continue to support low-carbon liquid fuels during this period of transition and for much harder sectors for ZEV technology such as aviation, locomotives, and marine applications. Biomethane currently displaces fossil fuels in transportation and will largely be needed for hard-to-decarbonize sectors but will likely continue to play a targeted role in some fleets while the transportation sector transitions to ZEVs. Figure 4-2 provides the detail on fuels used in 2020 and the fuel mix under the Scoping Plan Scenario for 2035 and 2045.

Figure 4-2: Transportation fuel mix in 2022, 2030, and 2045 in the Scoping Plan Scenario[332]



Private investment in alternative fuels will play a key role in diversifying the transportation fuel supply away from fossil fuels. The Low Carbon Fuel Standard is the primary mechanism for transforming California's transportation fuel pool with low-carbon

[332] See https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx for transportation fuels by year.

alternatives and has fostered a growing alternative fuel market. Partially as a result of the powerful market signals from the LCFS, fuels like renewable diesel, sustainable aviation fuel, biomethane, and electricity have all gained significant market shares and continue to displace gasoline and diesel in both on- and off-road vehicles. In addition, Executive Order N-79-20 calls on state agencies to support the transition of existing fuel production facilities away from fossil fuels and directs that this transition also protect and support workers, public health, safety, and the environment. In line with this direction, existing refineries could be repurposed to produce sustainable aviation fuel, renewable diesel, and hydrogen. This trend has already begun, and continuing to develop fuel production capacity in-state to support the energy transition while making the most efficient use of existing assets is critical to avoiding emissions leakage. If fuel demand persists after fuel production facilities have ceased operations, fuel demand will have to be met through imports.

As we transition or build new energy production facilities and infrastructure, it will be important to ensure low-income communities, tribes, and communities of color do not experience increases in existing air pollution disparities and continue to experience a reduction in the air pollution disparities that exist today. California must use the best available science to ensure that raw materials used to produce transportation fuels do not incentivize feedstocks with little to no GHG reductions from a life cycle perspective. A dramatic increase in alternative fuel production must not come at the expense of global deforestation, unsustainable land conversion, or adverse food supply impacts, to name a few examples. CARB will continue to monitor scientific findings on these topics to ensure that California policies, such as the LCFS, send the appropriate market signals and do not result in unintended consequences.[333]

Strategies for Achieving Success

- Accelerate the reduction and replacement of fossil fuel production and consumption in California.[334]
- Incentivize private investment in new zero-carbon fuel production in California.
- Incentivize the transition of existing fuel production and distribution assets to support deployment of low- and zero-carbon fuels while protecting public health and the environment.
- Invest in the infrastructure to support reliable refueling for transportation such as electricity and hydrogen refueling.

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[333] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. *finalejacrecs.pdf (arb.ca.gov)*.
[334] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F3. *finalejacrecs.pdf (arb.ca.gov)*.

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Initiate a public process focused on options to increase the stringency and scope of the LCFS:
    - Evaluate and propose accelerated carbon intensity targets pre-2030 for LCFS.
    - Evaluate and propose further declines in LCFS post-2030 carbon intensity targets to align with this 2022 Scoping Plan.
    - Consider integrating opt-in sectors into the program.
    - Provide capacity credits for hydrogen and electricity for heavy-duty fueling.
- Monitor for and ensure that raw materials used to produce low-carbon fuels or technologies do not result in unintended consequences.[335]

Vehicle Miles Traveled

Transforming the transportation sector goes beyond phasing out combustion technology and producing cleaner fuels. Managing total demand for transportation energy by reducing the miles people need to drive on a daily basis is also critical as the state aims for a sustainable transportation sector in a carbon neutral economy. Though GHG emissions are declining due to cleaner vehicles and fuels, rising VMT can offset the effective benefits of adopted regulations.

Even under full implementation of Executive Order N-79-20 and CARB's Advanced Clean Cars II Regulations, with 100 percent ZEV sales in the light-duty vehicle sector by 2035, a significant portion of passenger vehicles will still rely on ICE technology, as demonstrated in Figure 4-2 above. Accordingly, VMT reductions will play an indispensable role in reducing overall transportation energy demand and achieving the state's climate, air quality, and equity goals. After a significant pandemic-induced reduction in VMT during 2020, passenger VMT has steadily climbed back up and is now closing in on pre-pandemic levels.[336] Driving alone with no passengers remains the primary mode of travel in California, amounting to 75 percent of the mode share for daily commute trips. Conversely, the transit industry, which was significantly impacted during

[335] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. *finalejacrecs.pdf (arb.ca.gov)*.
[336] U.S. Department of Transportation. 2021. December 2021 Traffic Volume Trends. Figure 3 - Seasonally Adjusted Vehicle Miles Traveled by Month. *https://www.fhwa.dot.gov/policyinformation/travel_monitoring/21dectvt/figure3.cfm*.

the lockdown months, and has struggled to recover; ridership only averages two-thirds of pre-pandemic levels,[337] [338] and service levels also lag behind.

Sustained VMT reductions have been difficult to achieve for much of the past decade, in large part due to entrenched transportation, land use, and housing policies and practices. Specifically, historic decision-making favoring single-occupancy vehicle travel has shaped development patterns and transportation policy, generating further growth in driving (and making transit, biking and walking less viable alternatives). These policies have also reinforced long-standing racial and economic injustices that leave people with little choice but to spend significant time and money commuting long distances, placing a disproportionate burden on low-income Californians, who pay the highest proportion of their wages on housing and transportation. While CARB has included VMT reduction targets and strategies in the Scoping Plan and appendices, these targets are not regulatory requirements, but would inform future planning processes. CARB is not setting regulatory limits on VMT in the 2022 Scoping Plan; the authority to reduce VMT largely lies with state, regional, and local transportation, land use, and housing agencies, along with the Legislature and its budgeting choices.

Appendix E (Sustainable and Equitable Communities) elaborates on reasons for reducing VMT and identifies a series of policies that, if implemented by various responsible authorities, could help to achieve the recommended VMT reduction trajectory included in this Scoping Plan (and related mode share increases for transit and active transportation). These policies aim to advance four strategic objectives:

1. Align current and future funding for transportation infrastructure with the state's climate goals, preventing new state-funded projects from inducing significant VMT growth and supporting an ambitious expansion of transit service and other multimodal alternatives.
2. Move funding for transportation beyond the gasoline and diesel taxes and implement fuel-agnostic pricing strategies that accomplish more productive uses of the roadway network and generate revenues to further improve transit and other multimodal alternatives.
3. Deploy autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
4. Encourage future housing production and multi-use development in infill locations and other areas in ways that make future trip origins and destinations

[337] U.S. Government Accountability Office. January 25, 2022. During COVID-19, Road Fatalities Increased and Transit Ridership Dipped. *https://www.gao.gov/blog/during-covid-19-road-fatalities-increased-and-transit-ridership-dipped*.
[338] American Public Transportation Association. APTA - Ridership Trends. *https://transitapp.com/APTA*.

closer together and create more viable environments for transit, walking, and biking.

The pace of change to reduce VMT must be accelerated. Certainly, structural reform will be challenging, but California has demonstrated time and again that it possesses the collective leadership and commitment to break away from ideas that no longer represent Californians' values and their aspirations for the many generations to come.

Strategies for Achieving Success

- Achieve a per capita VMT reduction of at least 25 percent below 2019 levels by 2030 and 30 percent below 2019 levels by 2045. [339]
- Reimagine new roadway projects that decrease VMT in a way that meets community needs and reduces the need to drive.
- Invest in making public transit a viable alternative to driving by increasing affordability, reliability, coverage, service frequency, and consumer experience.[340]
- Implement equitable roadway pricing strategies based on local context and need, reallocating revenues to improve transit, bicycling, and other sustainable transportation choices.[341]
- Expand and complete planned networks of high-quality active transportation infrastructure.[342]
- Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
- Streamline access to public transportation through programs such as the California Integrated Travel Project.
- Ensure alignment of land use, housing, transportation, and conservation planning in adopted regional plans, such as regional transportation plans (RTP)/ sustainable communities strategies (SCS), regional housing needs assessments (RHNA), and local plans (e.g., general plans, zoning, and local transportation plans), and develop tools to support implementation of these plans.

[339] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. *finalejacrecs.pdf (arb.ca.gov)*.
[340] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. *finalejacrecs.pdf (arb.ca.gov)*.
[341] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. *finalejacrecs.pdf (arb.ca.gov)*.
[342] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1F. *finalejacrecs.pdf (arb.ca.gov)*.

- Accelerate infill development and housing production at all affordability levels in transportation-efficient places, with a focus on housing for lower-income residents.

Clean Electricity Grid

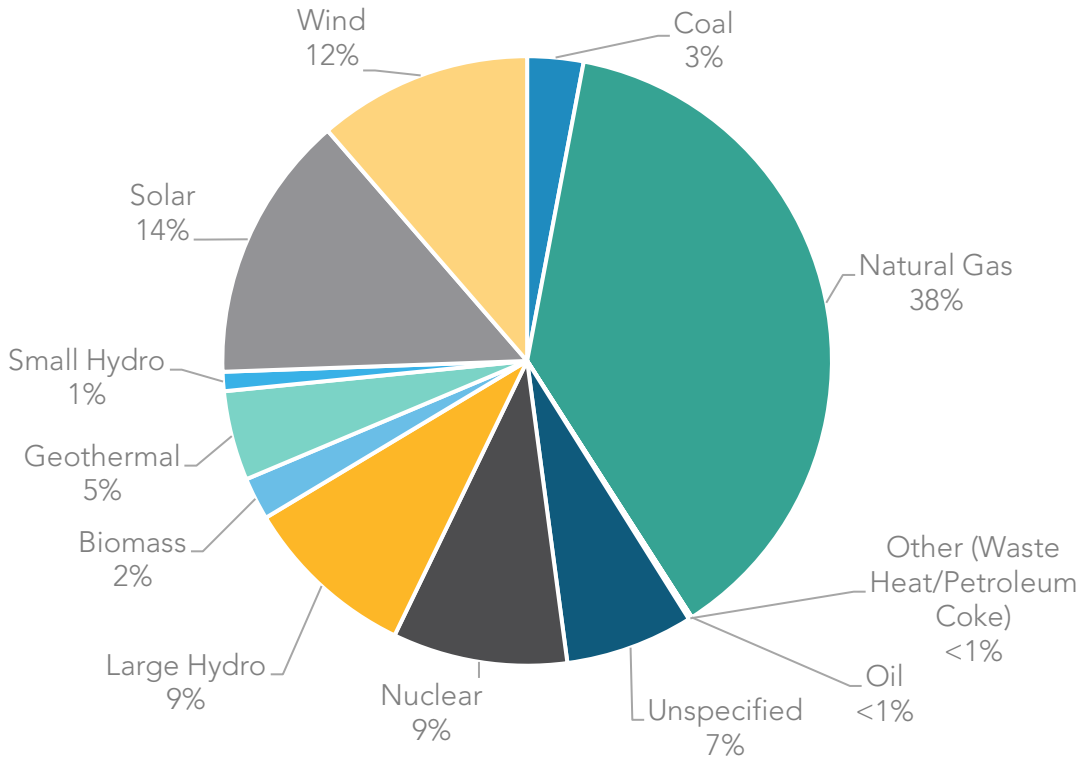
Much of the state's success to date in reducing GHGs is due to decarbonization of the electricity sector as a result of the RPS, SB 100 implementation, and the Cap-and-Trade Program. Moving forward, a clean, affordable, and reliable electricity grid will serve as a backbone to support deep decarbonization across California's economy. Under this Scoping Plan, the role of electricity in powering the economy will grow in almost every sector.

In 2021, 70 percent of California electricity demand was served by in-state power plants totaling about 82 GW, with the rest coming from out-of-state imports.[343] Additionally, approximately 8 GW of customer solar photovoltaic capacity has been installed to date to help with in-state demand.[344] Figure 4-3 shows the breakdown of in-state and imported sources of electricity.

[343] CEC. 2021. Electric Generation Capacity and Energy. Data available at: *https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy* and CEC. 2021. Total System Electric Generation. Data available at: *https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation*. Capacity values are nameplate capacity from sources 1 MW and larger.

[344] CEC. 2021. *SB 100 Joint Agency Report Summary: Achieving 100% Clean Electricity in California, An Initial Assessment.* 10. *https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity*.

Figure 4-3: 2021 total system electric generation (based on GWh)[345]



Note: Imports contributing to total system generation are comprised of 58% zero-carbon energy and 42% non-renewable and unspecified energy. Percentages do not add to exactly 100 due to rounding.

In 2021, about 48 percent of electricity generation serving California came from non-renewable and unspecified[346] resources, while 52 percent came from renewable and zero-carbon resources. The state's Strategic Reliability Reserve, established in AB 205 to provide additional reliability insurance during extreme events, may make three of the fossil gas-fired OTC plants planned for retirement available to support the grid on a limited basis after 2023. The state also adopted legislation to facilitate extension of the Diablo Canyon Nuclear Power Plant for five years beyond its 2025 planned closure.[347] At the

[345] *Total system generation* is the sum of all utility-scale, in-state generation, plus net electricity imports. CEC. 2021 Total System Electricity Generation. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation.

[346] *Unspecified power* refers to electricity that is not traceable to a specific generating facility, such as electricity traded through open market transactions. It typically consists of a mix of resources and may include renewables.

[347] In accordance with SB 846 (Dodd, Chapter 239, Statutes of 2022).

same time, the state continues to rapidly expand deployment of clean energy generation and storage resources and plan for increased electrification.[348] This is critical to reducing GHG emissions and addressing the long-term impacts of climate change.

Climate change is causing unprecedented stress on California's energy system—driving high demand and constraining supply. Heat, drought, and wildfires can both reduce electricity supply from reductions in hydropower generation and impacts on generation and transmission performance, and increase demand, especially in the evening hours when solar generation is declining.

California has experienced three straight years of energy reliability challenges, including a multi-day extreme heat event across the western United States with temperatures up to 20 degrees above normal in California, resulting in rotating outages in August 2020. In 2021, heat waves in June prompted a Grid Warning and the onset of emergency conditions, and the Bootleg Fire caused the loss of one transmission line, reducing import capability by 3,000 megawatts into the California Independent System Operator (CAISO) balancing authority area. And from August 31–September 9, 2022, a 10-day extreme heat event resulted in an unprecedented, sustained period of high peak loads in the CAISO system, averaging 47,000 MW and maxing at an all-time record of over 52,000 MW on September 6. The Western region also hit its record peak load on September 6, at 167.5 GW.

Reliable electricity service was maintained throughout the 10-day September 2022 heat wave in spite of the record breaking load levels. Factors that contributed to this outcome include the installation of over 3,500 MW of lithium-ion battery storage since summer 2020, enhanced coordination and communication within and outside of California, engagement with customer groups and other stakeholders, state actions to reduce load during critical times, and the additional capacity provided through the Strategic Reliability Reserve and other new state programs authorized in the 2022 Budget to provide load reduction and support the grid in extreme events. CEC, CPUC, CAISO, and the California Department of Water Resources will continue to build out strategies to enhance reliability in light of the increasing and compounding impacts of climate change on the electricity system.

[348] In June 2021, the CPUC adopted D.21-06-035 directing procurement of 11,500 MW of new capacity between 2023 and 2026 to ensure systemwide electric reliability as Diablo Canyon and several OTC facilities retire. It requires that, out of the 11,500 MW, 2,500 MW must be from zero-emission resources. Additionally, 2,000 MW must be long lead-time resources, with at least 1,000 MW of long-duration storage and 1,000 MW of firm capacity with zero on-site emissions or that qualifies under the RPS eligibility requirements.

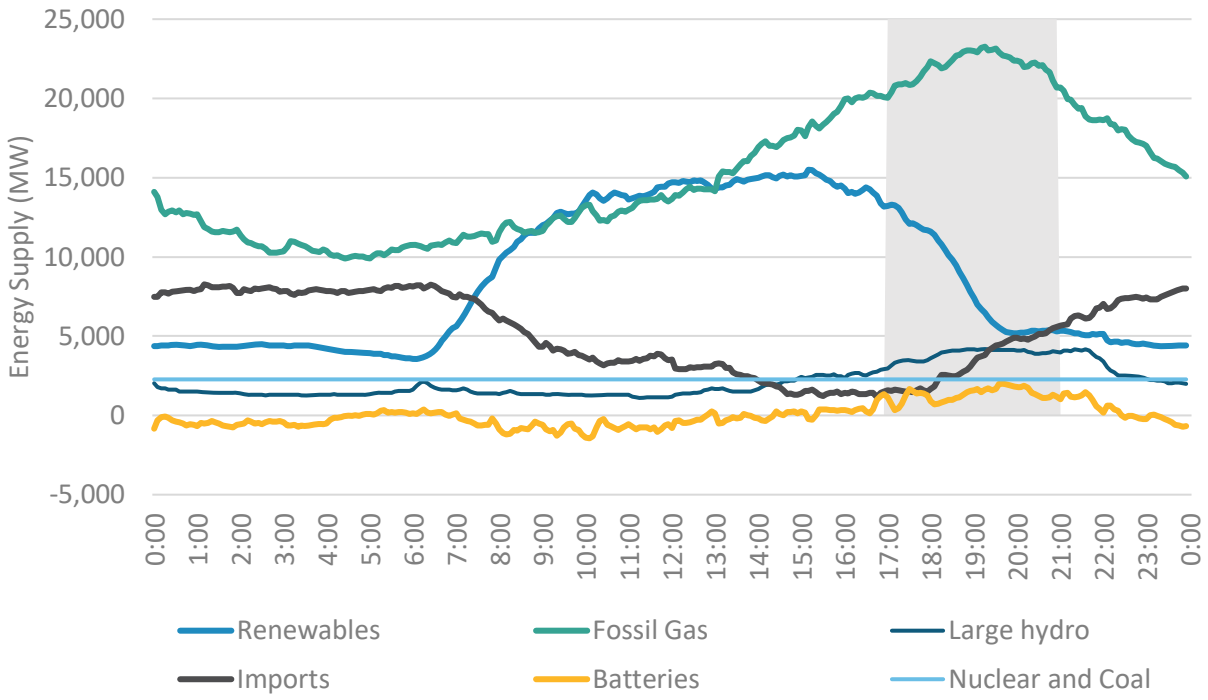
While the electricity sector is using less fossil fuel due to increasing amounts of renewables,[349] existing fossil gas generation will continue to play a critical role in grid reliability until other clean, dispatchable alternatives can be deployed at scale. The integration of greater amounts of variable renewable generation resources[350] is changing power system planning and operations, and system operators need resources with flexible attributes to balance shifting supply and demand.

High levels of solar generation can lead to instances of oversupply during the middle of the day, when the sun is brightest.[351] In the evening hours, as the sun is setting, solar generation declines to zero and customers with solar generation shift back to the electric grid. In hot weather, customer demand remains high well into the summer evening period to power air conditioning, which can lead to reliability challenges.[352]

Figure 4-4 shows the energy sources used throughout one summer day in July. Renewable energy is consistent during the middle of the day, but it cannot meet all of the evening demand in the gray area. As illustrated in the figure, fossil gas generation is currently a resource that is typically ramped up to meet this evening demand as solar production begins to drop and electrical loads increase To help address this challenge, resource installations that pair solar with batteries, as well as a greater amount of battery build-out, are coming online currently and over the next five years. Nevertheless, the state's electricity grid is expected to be stressed further in the coming years by heat waves, drought, wildfires, and the growing intermittent power supply from renewables. California must accelerate deployment of diverse clean energy resources to maintain reliability and affordability in the face of climate change.

[349] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*.
[350] A *variable renewable generation resource* is a renewable source of electricity that is non-dispatchable due to its fluctuating nature and only produces electricity when weather conditions are right, such as when the sun is shining or the wind is blowing. Renewable resources that can be controlled and are dispatchable include geothermal, biomass, and dam-based hydroelectric power.
[351] *Brightness* is used colloquially here; solar energy depends on insolation (e.g., sun-hours), which is the measurement of cumulative solar energy that reaches an area over a period of time.
[352] CAISO, CPUC, and CEC. 2021. *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave.* *http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf*.

Figure 4-4: Electricity supply trend by resource for a California summer day, July 2022



Sector Transition

Decarbonizing the electricity sector is a crucial pillar of this Scoping Plan. It depends on both using energy more efficiently and replacing fossil-fueled generation with renewable and zero carbon resources, including solar, wind, energy storage,[353] geothermal, biomass, and hydroelectric power. The RPS Program[354] and the Cap-and-Trade Program continue to incentivize dispatch of renewables over fossil generation to serve state demand. SB 100 increased RPS stringency to require 60 percent renewables by 2030 and for California to provide 100 percent of its retail sales[355] of electricity from renewable and zero-carbon resources by 2045. Furthermore, SB 1020 has added interim targets to

[353] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

[354] The CEC estimates that 36 percent of California's 2019 retail electricity sales was served by RPS-eligible renewable resources (see CPUC. 2021. CPUC Perspectives on Electric Sector Decarbonization. *https://ww2.arb.ca.gov/sites/default/files/2021-11/CPUC-sp22-electricity-ws-11-02-21.pdf*).

[355] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* interprets this to mean that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

SB 100's policy framework to require renewable and zero-carbon resources to supply 90 percent of all retail electricity sales by 2035 and 95 percent of all electricity retail sales by 2040; the governor has asked the CEC to establish a planning goal of at least 20 GW of offshore wind by 2045; and the governor directed that state agencies plan for an energy transition that avoids the need for new fossil gas capacity to meet California's long-term energy goals.[356] In addition to grid-level resources, state efforts have supported rapid growth of the distributed solar industry through key actions like the California Solar Initiative (SB 1, Murray, Chapter 132, Statues of 2006).[357] Steps to commercialize microgrids powered by clean resources[358] are also being examined as part of SB 1339 (Stern, Chapter 566, Statutes of 2018).[359]

California also continues to advance its appliance and building energy efficiency standards to reduce growth in electricity consumption and meet the SB 350 goal to double statewide energy efficiency savings in electricity and fossil gas end uses[360] by 2030. In 2018, the CEC adopted a building energy efficiency code requiring most new homes to have solar photovoltaic systems[361] (or be powered by a solar array nearby) starting January 1, 2020. In 2019, California reached the milestone of 1 million solar rooftop installations.

Increased transportation and building electrification and continued policy commitment to behind-the-meter solar and storage will continue to drive growth of microgrids and other distributed energy resources (DER).[362] The CPUC's High-DER proceeding is examining how to prepare the electric grid for a high DER future by determining how to integrate

[356] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.
[357] More information on the program, which closed in 2016, can be found on the CPUC website, including annual program assessment reports, at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/california-solar-initiative*.
[358] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, In part (NF2, NF13). *finalejacrecs.pdf (arb.ca.gov)*.
[359] CPUC. Resiliency and Microgrids. *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids*.
[360] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, ES1. *finalejacrecs.pdf (arb.ca.gov)*.
[361] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2. *finalejacrecs.pdf (arb.ca.gov)*.
[362] Distributed energy resources include rooftop solar and other distributed renewable generation resources, energy storage, electric vehicles, time variant and dynamic electric rates, flexible load management, demand response, and energy efficiency technologies.

millions of DERs within the distribution grid to maximize societal and ratepayer benefits from DERs while ensuring grid reliability and affordable rates.[363]

SB 350 also aims to connect long-term planning for electricity needs with the state's climate targets. This is primarily accomplished through CARB's establishment of 2030 GHG emissions targets for the electricity sector in general and for each electricity provider, which inform the CPUC and publicly owned utilities' integrated resource planning. A GHG planning target range of 30 to 53 MMTCO_2e—informed by the 2017 Scoping Plan—was originally developed and adopted by CARB in 2018. In its 2021 IRP planning cycle, the CPUC adopted a 38 MMT GHG target for the electricity sector in 2030, which drops to 35 MMT in 2032.[364]

The Scoping Plan Scenario incorporates SB 350's energy efficiency doubling goal, aligns with the CPUC's IRP 2030 GHG target and latest GHG emissions benchmarks through 2035,[365] the governor's 20 GW offshore wind and no new gas generation[366] goals, and SB 100's 2030 RPS and 2045 zero-carbon retail sales targets to reduce dependence on fossil fuels in the electricity sector by transitioning substantial energy demand to renewable and zero-carbon resources.[367] As described in Chapter 2, CCS is applied in limited sectors, including on 16.7 MMT of CO_2 from existing fossil gas electricity generation in 2045, to ensure the state achieves the 85 percent reduction in anthropogenic emissions required by AB 1279. Continued transition to renewable and

[363] The High-DER proceeding is one of four "anchor" proceedings in the CPUC's DER Action Plan 2.0 and is within the Action Plan's infrastructure track. Information on the High-DER proceeding is available at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/distribution-planning*. The Action Plan can be accessed at: *https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/der-action-plan*.

[364] The February 10, 2022, Decision 22-02-004 by the CPUC adopts the 2021 Preferred System Plan, completing the 2019–21 IRP cycle. *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M451/K412/451412947.PDF*. The Decision requires load serving entities to submit plans in the next IRP cycle detailing how they will meet their proportionate share of a 30 MMT electric sector target, as well as a 38 MMT GHG target.

[365] June 15, 2022, Administrative Law Judge's Ruling for 2022 integrated resource plan filings specifies the need for GHG targets to plan for in 2035 to continue progress toward the 2045 goal. The ruling proposes a straight-line projection from the GHG planning target for 2030. Corresponding to the adopted Preferred System Plan in D.22-02-004, 38 MMT in 2030 leads to a target of 30 MMT in 2035. *https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M485/K625/485625915.PDF*.

[366] The governor's July 22, 2022, letter specifies no new gas generation but does not place any constraints on existing gas resources. Therefore, for purposes of RESOLVE electricity sector modeling, existing gas capacity is an available resource that is able to be reduced over time based on announced retirements or if selected for retirement by the model.

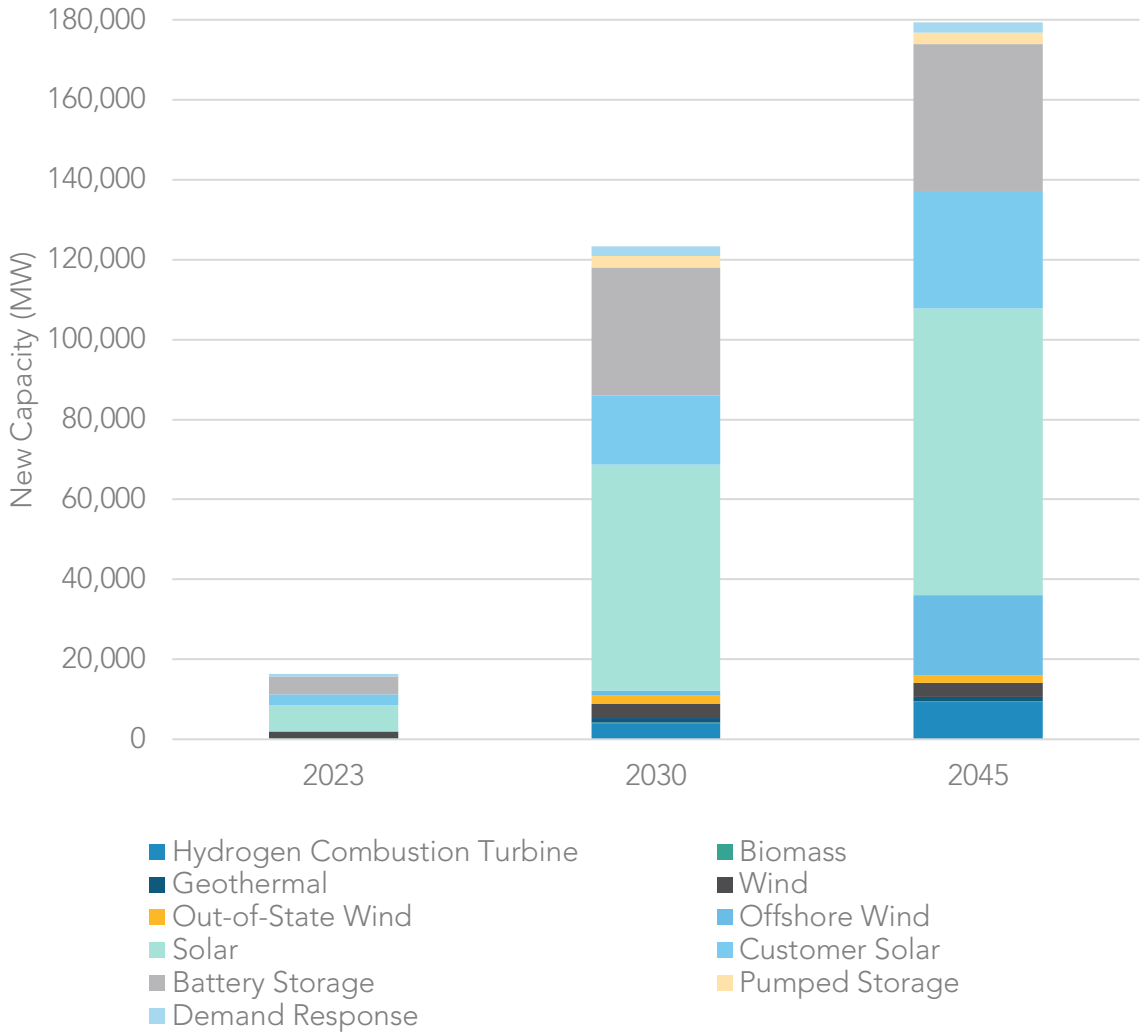
[367] CARB. 2021. PATHWAYS Scenario Modeling: 2022 Scoping Plan Update – Attachment B: Generation Technologies to be included in Modeling. *https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf*.

zero-carbon electricity resources will enable electricity to become a zero-carbon substitute for fossil fuels across the economy.

Figure 4-5 shows the modeled resource capacity to meet the SB 100 retail sales target.[368] Energy efficiency moderates some of the need for additional electricity generation. However, that is quickly surpassed by growing electricity demand of 26 percent by 2030 and 76 percent by 2045 compared to today (2022) from increased population and electrification of other sectors, as shown in Figure 4-6. The estimated resource build needed to meet this level of demand amounts to approximately 72 GW of utility solar[369] and 37 GW of battery storage by 2045. Annual build rates (over the 2022–2035 period) for the Scoping Plan Scenario will need to increase by about 60 percent and over 700 percent for utility solar and battery storage, respectively, compared to historic maximum rates.[370] To reach the 2045 target, the state will need to quadruple its current level of wind and solar capacity. This does not include capacity associated with hydrogen production nor mechanical CDR, which was modeled off-grid; assuming hydrogen production via electrolysis, this would roughly be equivalent to an additional 10 GW[371] of solar generation needed in 2045, and an additional 64 GW of solar generation for direct air capture in 2045. The scale of solar and battery build rates needed could be reduced through the commercialization of new zero-carbon technologies.

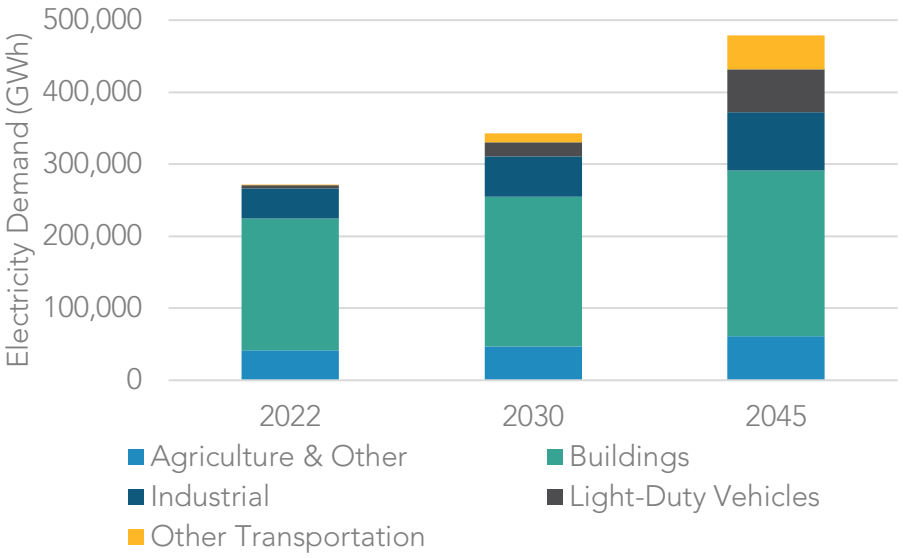
[368] SB 846 requires that load-serving entities exclude energy, capacity, or any attribute from the Diablo Canyon power plant in their resource plans. The Scoping Plan Scenario excludes energy, capacity, or any attribute from the Diablo Canyon power plant after the prior planned retirement date of 2025.
[369] The amount of additional customer solar included in the Scoping Plan Scenario is 29,208 MW by 2045.
[370] E3. 2022. CARB Scoping Plan: AB32 Source Emissions Final Modeling Results. PowerPoint. *https://ww2.arb.ca.gov/sites/default/files/2022-11/SP22-MODELING-RESULTS-E3-PPT.pdf*. Build rates are from EIA data historical builds in the 2011–2021 time frame.
[371] The estimate does not include hydrogen production assumed to be produced with bioenergy with carbon capture and storage (BECCS) and steam methane reforming (SMR).

Figure 4-5: Projected new electricity resources needed by 2045 in the Scoping Plan Scenario[372]



[372] See *https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx* for the capacity build-out by resource type.

Figure 4-6: Electric loads in 2022, 2030 and 2045 for the Scoping Plan Scenario[373]



This transformation will drive investments in a large fleet of generation and storage resources but will also require significant transmission to accommodate these new capacity additions. Transmission needs include high-voltage lines to access out-of-state resources and major in-state generation pockets. In consideration of typical 8- to 10-year lead times for many projects, the CAISO published its first 20-Year Transmission Outlook to inform transmission planning focused on meeting the needs identified through the 2021 SB 100 Joint Agency Report process. The outlook calls for significant transmission development to access offshore wind and out-of-state wind and reinforce the existing CAISO footprint at an estimated cost of $30.5 billion.[374]

Presently, fossil gas power plants provide about 75 percent of the flexible capacity for grid reliability as more renewable power enters the system. Moving forward, other resources such as storage and demand-side management are essential to maintain reliability with high concentrations of renewables. Hydrogen produced from renewable resources and renewable feedstocks can serve a dual role as a low-carbon fuel for existing combustion turbines or fuel cells, and as energy storage for later use. Reliability

[373] *Other Transportation* includes all non-light-duty vehicles and reflects electrification of modes like passenger and freight rail, aviation, and ocean-going vessels.
[374] CAISO. 2022. *20 Year Transmission Outlook.* http://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf.

also can be supported through increased coordination and markets in the interconnected western power grid; this is already helping to better integrate renewables.[375]

Strategies for Achieving Success

- Use long-term planning processes (Integrated Energy Policy Report, IRP, CAISO Transmission Planning Process, AB 32 Climate Change Scoping Plan) to support grid reliability and expansion of renewable and zero-carbon resource and infrastructure deployment.
- Complete systemwide and local reliability assessments across CAISO and other balancing authority areas, using realistic assumptions for land use, build rates, statewide and distribution system level constraints, and energy needs. Such assessments should be completed before state agencies update their electricity sector GHG targets.
- Prioritize actions to mitigate impacts to electricity reliability and affordability and provide sufficient flexibility in the state's decarbonization roadmap for adjustments as may be needed.
- Facilitate long lead-time resource development through the IRP and the SB 100 interagency process and through technology development and demonstration funding[376] that includes resources such as long-duration energy storage and hydrogen production.
- Continue coordination between energy agencies and energy proceedings to maximize opportunities for demand response.
- Continue to explore the benefits of regional markets to enhance decarbonization, reliability, and affordability.
- Address resource build-out challenges, including permitting, interconnection, and transmission network upgrades.
- Explore new financing mechanisms and rate designs to address affordability.[377]
- Per SB 350, double statewide energy efficiency savings in electricity and fossil gas end uses by 2030, through a combination of energy efficiency and fuel substitution actions.[378]
- Per SB 100 and SB 1020, achieve 90 percent, 95 percent, and 100 percent

[375] CEC. 2021. *2021 SB 100 Joint Agency Report – Achieving 100 Percent Clean Electricity in California: An Initial Assessment.* Publication Number: CEC-200-2021-001.
[376] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, ES2. The committee recommendation speaks specifically to offshore wind production. *finalejacrecs.pdf (arb.ca.gov)*.
[377] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF30. *finalejacrecs.pdf (arb.ca.gov)*.
[378] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

renewable and zero-carbon retail sales by 2035, 2040, and 2045, respectively.

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Target programs and incentives to support and improve access to renewable and zero-carbon energy projects (e.g., rooftop solar, community owned or controlled solar or wind, battery storage, and microgrids) for communities most at need, including frontline, low-income, rural, and indigenous communities.[379]
- Prioritize public investments in zero-carbon energy projects to first benefit the most overly burdened communities affected by pollution, climate impacts, and poverty.[380]

Sustainable Manufacturing and Buildings

Fossil gas is the primary gaseous fossil fuel used to produce heat at industrial facilities, as well as in residential and commercial buildings. In buildings, space and water heating, cooking, and clothes drying all rely on gaseous fuels today. Industrial processes that require heat for conventional boilers and other processes also rely on gaseous fuels. Refineries rely on fossil gas and other gaseous fossil fuels, like liquefied petroleum gas and refinery fuel gas, and fossil gas is also used to generate electricity, as discussed earlier.

Gaseous fossil fuel use can be displaced by four primary alternatives: zero-carbon electricity, solar thermal heat, hydrogen, and biogas/biomethane. Displacing gaseous fossil fuel use can yield indoor air quality benefits, protect public health and property from unexpected fossil gas leaks, and reduce short-lived climate pollutants, which are many times more potent in affecting climate change than CO_2. The Scoping Plan Scenario reduces dependence on fossil gas in the industrial and building sectors by transitioning substantial energy demand to alternative fuels. Reducing fossil gas combustion also will help toward achieving our air quality and equity goals by reducing pollution in neighboring areas and communities. In addition, reduced dependence on gasoline and diesel in the transportation sector diminishes the need for gaseous fossil fuels to support oil and gas production and petroleum refining operations as those are phased down relative to the demand.

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[379] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2, NF9, NF11, NF12, NF13. *finalejacrecs.pdf (arb.ca.gov)*.

[380] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF14. *finalejacrecs.pdf (arb.ca.gov)*.

Sector Transition

Industry

California's industrial sector contributes significantly to the state's economy, with a total output from manufacturing in 2019 of $324 billion (10.4 percent of the state total)[381] and employment of 1,222,000 manufacturing jobs (7.6 percent of the total state workforce).[382] California industry includes a diverse range of facilities, including cement plants, refineries, glass manufacturers, oil and gas producers, paper manufacturers, mining operations, metal processors, and food processors. Combustion of fossil gas, other gaseous fossil fuels, and solid fossil fuels provide energy to meet three broad industry needs: electricity, steam, and process heat. Non-combustion emissions result from fugitive emissions and from the chemical transformations inherent to some manufacturing processes. About 20 percent of the GHG emissions from the industrial sector are non-combustion emissions.

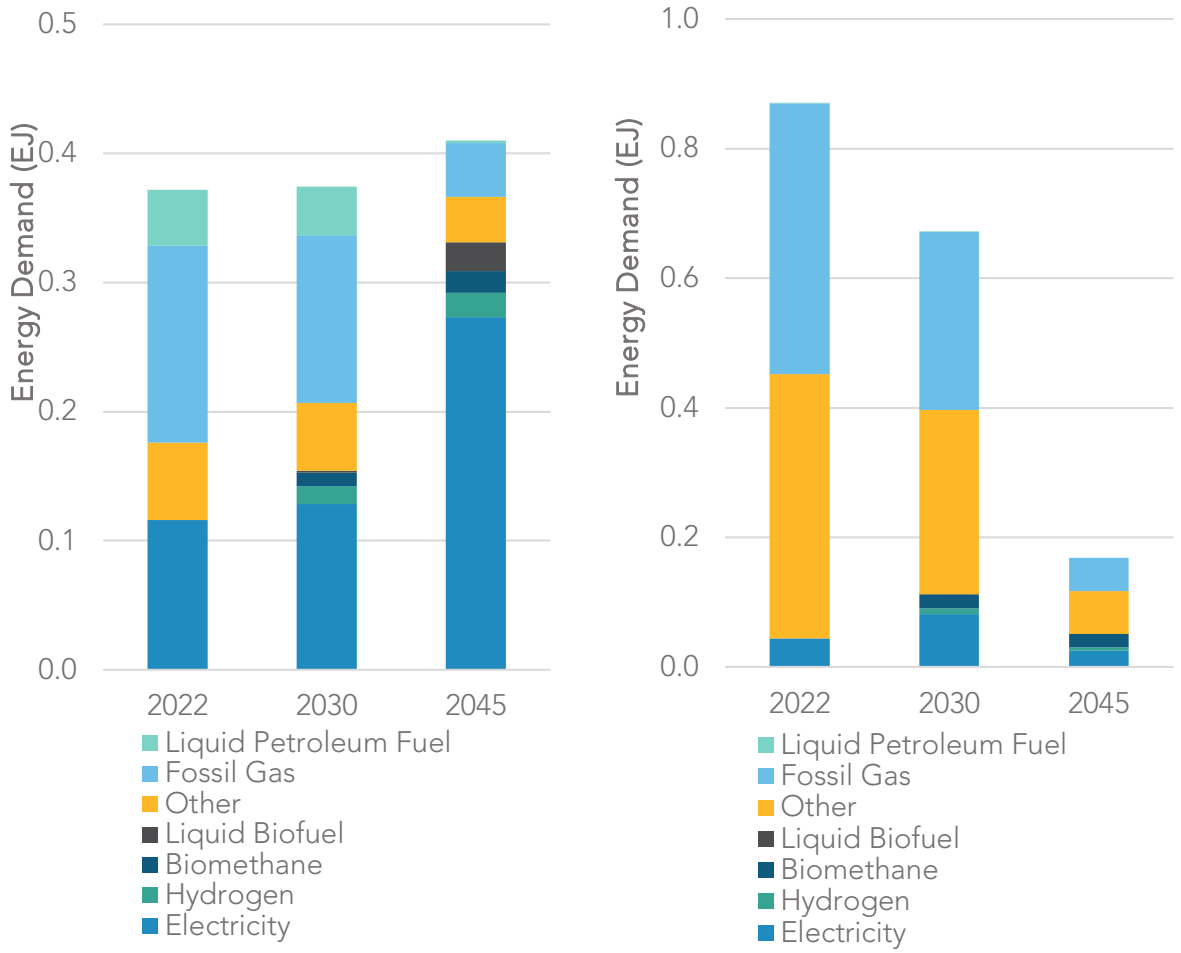
Decarbonizing industrial facilities depends upon displacing fossil fuel use with a mix of electrification, solar thermal heat, biomethane, low- or zero-carbon hydrogen, and other low-carbon fuels to provide energy for heat and reduce combustion emissions. Emissions also can be reduced by implementing energy efficiency measures and using substitute raw materials that can reduce energy demand and some process emissions. Some remaining combustion emissions and some non-combustion CO_2 emissions can be captured and sequestered. The strategy employed will depend on the industrial subsector and the specific processes utilized in production. The left side of Figure 4-7 illustrates the fuels used to meet industrial manufacturing energy demand in 2020. Industrial manufacturing energy demand needs to transition to the fuel mix shown for 2035 and 2045. The right side of Figure 4-7 illustrates the fuel mix needed to meet the energy demand of oil and gas extraction and petroleum refining operations for the same years. Energy demand in this portion of the industrial sector declines along with decreased demand for gasoline and diesel in the transportation sector. In both figures there is a continuing demand for fossil gas due to lack of non-combustion technologically feasible or cost-effective alternatives for certain industrial sectors. Policies that support decarbonization strategies like electrification, use of renewable energy, and transition to alternative fuels are needed.

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[381] National Association of Manufacturers (NAM). 2021 California Manufacturing Facts. *https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/*.

[382] NAM. 2021 California Manufacturing Facts. *https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/*.

Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario[383]



Electrification and solar thermal heat are best-suited to industrial processes that have relatively low heat requirements, such as food processors, paper mills, and industries that use low-pressure steam in their processes. Approaches could include replacing fossil gas boilers with electric boilers, process heaters with industrial electric heat pumps, steel forging furnaces with induction heaters, and implementing other sector-specific process electrification. Under current rate structures for industrial electricity and fossil gas in

[383] *Other* fuel in the industrial manufacturing sector is primarily coke and coal for cement production. *Other* fuel in the petroleum refining sector is primarily fossil gas associated with refining petroleum products.

California, most projects to electrify a fossil gas-powered industrial process will face operating cost barriers and potential reliability concerns. Microgrids powered by renewable resources and with battery storage are emerging as a key enabler of electrification and decarbonization at industrial facilities.

There are fewer commercially available and economically viable electrification options to replace industrial processes that require higher-temperature heat. For these processes, onsite combustion may continue to be needed, and decarbonization will require fuel substitution to hydrogen,[384] biomethane, or other low-carbon fuels. Fuel substitution and continued combustion will require monitoring and mitigation of any potential air quality impacts, especially in low-income and communities of color which already face disproportionate air pollution burdens. Industries in California with high heat needs include steel forging, glass manufacturing, and industries with calcination processes, such as manufacturing lime and cement.

Onsite emissions from cement manufacturing derive from two main sources: (1) fuel combustion to heat the kiln to a very high temperature and (2) process CO_2 emissions from the chemical transformation of limestone. Over 60 percent of emissions from the sector are process emissions unrelated to fuel use, and most emissions related to fuel use are from coal and petroleum coke combustion. Process emissions from cement manufacturing are significant and will continue even if the sector were to operate using only zero-carbon fuels; thus carbon capture and use/sequestration will be a likely component of any strategy to fully decarbonize cement manufacturing. There are additional opportunities to reduce GHG emissions from cement manufacturing via the combination of fuel-switching to low-carbon fuels (e.g., biomethane, municipal solid waste, biochar), increased blending of non-clinker materials, and efficiency improvements. High technological and economic barriers exist to electrifying kiln process heat at cement plants, as clinker production requires temperatures in excess of 1,500°C. There are potential decarbonization opportunities throughout the value chain of cement use, including in cement manufacturing, concrete mixing, and construction practices.[385] SB 596 (Becker, Chapter 246, Statutes of 2021), which was signed by Governor Newsom in September 2021, requires CARB to develop a comprehensive strategy for cement use in California to achieve a GHG intensity 40 percent below 2019 levels by 2035, and net-zero emissions by 2045.

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[384] Griffiths, Steve, Benjamin K. Sovacool, Jinsoo Kim, Morgan Bazilian, and Joao M. Uratani. 2021. "Industrial decarbonization via hydrogen: A critical and systematic review of developments, socio-technical systems and policy options." *Energy Research & Social Science* 80. 102208, ISSN 2214-6296. *https://doi.org/10.1016/j.erss.2021.102208*.

[385] California Nevada Cement Association. Achieving Carbon Neutrality in the California Cement Industry. *https://cncement.org/attaining-carbon-neutrality*.

Oil and gas extraction and refining make up over half of California's industrial GHG emissions. Reduced demand for transportation fossil fuels corresponds to reduced supply of fossil gas and other gaseous fossil fuels for refineries to produce these fuels. Some refining operations will continue to operate to produce fossil fuel for the remaining transportation energy demands, along with renewable diesel and sustainable aviation fuel, as discussed in the Transportation Sustainability section of this chapter.

Across industrial subsectors and processes, California facilities also could realize significant reductions in GHG emissions and energy-related costs by implementing advanced energy efficiency projects and tools.[386] While enhanced operation and maintenance practices are typical at industrial facilities, additional strategic energy management practices offer greater efficiency gains by focusing on setting goals, tracking progress, and reporting results.

Strategies for Achieving Success

- Maximize air quality benefits using the best available control technologies for stationary sources in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[387]
- Prioritize alternative fuel transitions first in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[388]
- Invest in research and development and pilot projects to identify options to reduce materials and process emissions along with energy emissions in California's industrial manufacturing facilities, leveraging programs like the CEC's Electric Program Investment Charge (EPIC).[389]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Support electrification with changes to industrial rate structures.
- Develop infrastructure for CCS and hydrogen production to reduce GHG emissions where cost-effective and technologically feasible non-combustion alternatives are not available.
- Implement SB 905.

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[386] Therkelsen, Peter, Aimee McKane, Ridah Sabouini, and Tracy Evans. 2013. *Assessing the Costs and Benefits of the Superior Energy Performance Program.* U.S Department of Energy. *https://www.osti.gov/servlets/purl/1165470*.

[387] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT14. *finalejacrecs.pdf (arb.ca.gov)*.

[388] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT15. *finalejacrecs.pdf (arb.ca.gov)*.

[389] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, M20. *finalejacrecs.pdf (arb.ca.gov)*.

- Establish markets for low-carbon products and recycled materials using Buy Clean California Act and other mechanisms relying on robust data
- Develop a net-zero cement strategy to meet SB 596 targets for the GHG intensity of cement use in California.
- Continue to leverage energy-efficiency programs, including the U.S. DOE's ENERGY STAR program,[390] U.S. DOE's Superior Energy Performance program,[391] and ISO 50001.[392]
- Evaluate and continue to offer incentives to install energy efficiency and renewable energy technologies through programs such as CPUC decisions as part of rulemaking R.19-09-009[393] and the CEC's Food Production Investment Program (FPIP) and EPIC programs.[394]
- Leverage low-carbon hydrogen programs, including the Bipartisan Infrastructure Law, for regional hydrogen hubs, hydrogen electrolysis, and hydrogen manufacturing and recycling.
- Evaluate the role of hydrogen in meeting GHG emission reductions, including policy recommendations regarding the use of hydrogen in California as required by SB 1075.
- Address cost barriers to promote low-carbon fuels for hard-to-electrify industrial applications.

Buildings

Buildings have cross-sector interactions that influence our public health and well-being and affect land use and transportation patterns, energy use, water use, and indoor and outdoor environments.[395] There are about 14 million existing homes and over 7.5 billion square feet of existing commercial buildings[396] in California. Fossil gas supplies about half of the energy consumed by end uses in these buildings. In addition to GHG emissions, fossil gas usage in buildings also produces CO_2, NOx, $PM_{2.5}$, and

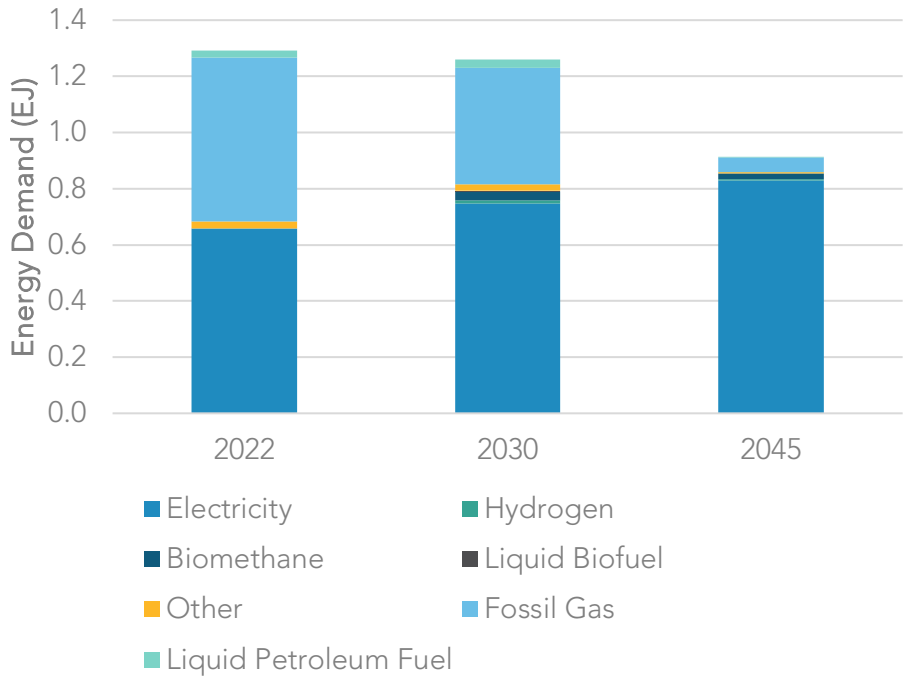
[390] ENERGY STAR. ENERGY STAR Guidelines for Energy Management. *https://www.energystar.gov/buildings/tools-and-resources/energy-star-guidelines-energy-management*.
[391] Energy.gov. Superior Energy Performance 50001. *https://www.energy.gov/eere/amo/superior-energy-performance*.
[392] ISO. ISO 50001 Energy Management. *https://www.iso.org/iso-50001-energy-management.html*.
[393] CPUC. January 14, 2021. CPUC Adopts Strategies to Help Facilitate Commercialization of Microgrids Statewide. *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M360/K370/360370887.PDF*.
[394] Bailey, Stephanie, David Erne, and Michael Gravely. 2021. *Final 2020 Integrated Energy Policy Report Update, Volume II: The Role of Microgrids in California's Clean and Resilient Energy Future, Lessons Learned From the California Energy Commission's Research.* California Energy Commission. Publication Number: CEC-100-2020-001-V2-CMF.
[395] See Appendix F (Building Decarbonization).
[396] CEC. 2021. California Building Decarbonization Assessment. *https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311&DocumentContentId=72767*.

formaldehyde.[397] Each year, about 120,000 new homes[398] and more than 100 million-square feet[399] of commercial buildings are newly constructed across California. These new buildings will represent between a third to half of the total building stock by mid-century.

Achieving carbon neutrality must include transitioning away from fossil gas in residential and commercial buildings, and will rely primarily on advancing energy efficiency while replacing gas appliances with non-combustion alternatives. This transition must include the goal of trimming back the existing gas infrastructure so pockets of gas-fueled residential and commercial buildings do not require ongoing maintenance of the entire limb for gas delivery. Blending low-carbon fuels such as hydrogen and biomethane into the pipeline further displaces fossil gas. Pipeline safety and reliability must be evaluated to accommodate low-carbon fuels. Figure 4-8 illustrates the energy Californians use in buildings at present compared with the Scoping Plan Scenario, which introduces alternatives to fossil gas. In that scenario almost 90 percent of energy demand is electrified by 2045, and the remaining energy demand is met with combustion of hydrogen, biomethane, and fossil gas.

[397] Zhu, Yifang, et al. 2020. *Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California.* UCLA Fielding School of Public Health Department of Environmental Health Sciences.
[398] Construction Industry Research Board. 2018. Annual Building Permit Summary. *http://www.cirbreport.org*.
[399] Delforge, Pierre. August 11, 2021. California Forging Ahead on Zero Emission Buildings. Blog. NRDC. *https://www.nrdc.org/experts/pierre-delforge/california-forging-ahead-zero-emission-buildings*.

Figure 4-8: Final energy demand in buildings in 2022, 2030, and 2045 in the Scoping Plan Scenario[400]

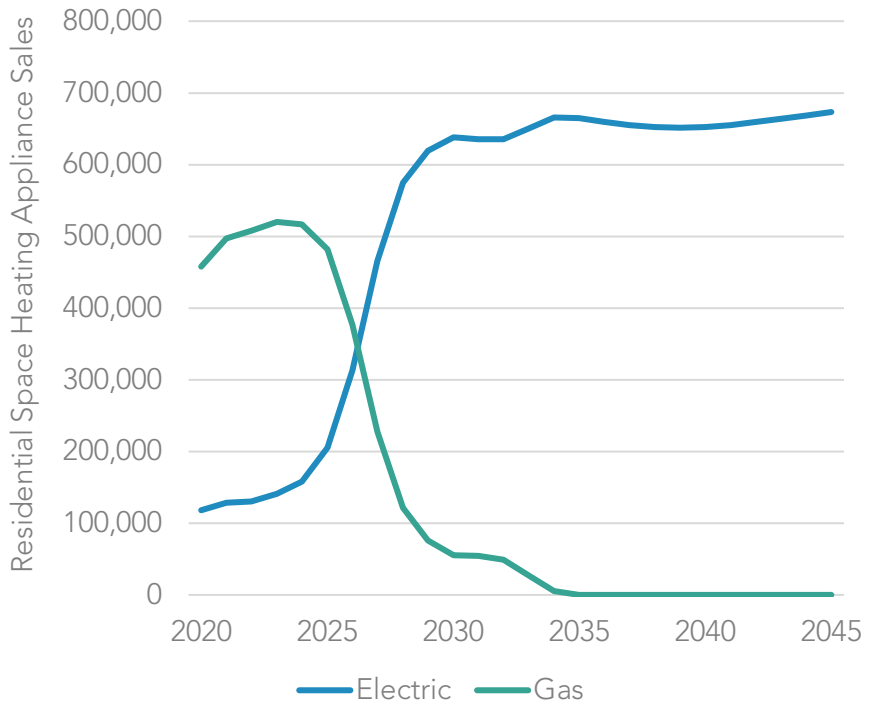


This transition is achieved when all new buildings constructed include non-combustion appliances, and appliances in existing buildings are replaced at the end of their useful life with non-combustion alternatives. Currently, electric alternatives, combined with the decarbonizing of California's grid, are the most effective alternatives, and the Scoping Plan Scenario modeled these alternatives. The Scoping Plan Scenario assumes three million all-electric and electric-ready homes by 2030 and seven million by 2035. Figure 4-9 illustrates the pace at which electric space heating appliance sales increase and gas space heating appliance sales decrease in residences in the Scoping Plan Scenario, such that by 2035 100 percent of residential home appliance sales are electric. By 2030 over six million electric heat pumps are installed statewide. The residential electric space heating appliance sales increases rapidly in the near term as new all-electric buildings are constructed and as existing buildings are renovated to utilize electric appliances. A similar transition is envisioned for other home appliances. Commercial buildings also will undergo a transition away from gas appliances to electric appliances, achieving 80 percent sales of all-electric appliances by 2035 and 100 percent by 2045. Appendix F (Building Decarbonization) describes a holistic policy approach to rapidly grow the

[400] *Other* fuel in the buildings sector is primarily liquid petroleum gas and waste heat.

number of zero emission appliances and buildings, to surmount the market barriers, and to prioritize an equitable transition for vulnerable communities.

Figure 4-9: Residential space heating appliance sales in the Scoping Plan Scenario



Strategies for Achieving Success

- Prioritize California's most vulnerable residents with the majority of funds in the new $922 million Equitable Building Decarbonization program, created through the 2022–2023 state budget. This would include residents in frontline, low-income, disadvantaged, rural, and tribal communities. This program is dedicated to a statewide direct-install building retrofit program for low-income households to replace fossil fuel appliances with electric appliances, energy-efficient lighting, and building insulation and sealing while also coordinating reductions in gas infrastructure in specific geographic areas.
- Achieve three million all-electric and electric-ready homes by 2030 and seven million by 2035 with six million heat pumps installed statewide by 2030.
- Expand incentive programs to support the holistic retrofit of existing buildings, especially for vulnerable communities.
- Ensure that incentive programs prioritize energy affordability and tenant protections, promote affordable and low-income household retrofits that improve habitability and reduce expenses, protect and empower small landlords and homeowners, address overlooked consumer groups, and pair decarbonization

with other critically needed renovation efforts to ensure that buildings support human health and are climate- and weather-resistant.[401]

- End fossil gas infrastructure expansion for newly constructed buildings.[402]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Strengthen California's building standards to support zero-emission new construction.
- Develop building performance standards for existing buildings.
- Adopt a zero-emission standard for new space and water heaters sold in California beginning in 2030, as specified in the 2022 State Strategy for the State Implementation Plan.
- Expand use of low-GWP refrigerants within buildings.
- Support electrification with changes to utility rate structures and by promoting load management programs.
- Increase funding for incentive programs and expand financing assistance programs focused on existing buildings and appliance replacements.
- Expand consumer education efforts to raise awareness and stimulate the adoption of decarbonized buildings and appliances, especially in vulnerable communities.
- Implement biomethane procurement targets for investor-owned utilities as specified in SB 1440 (Hueso, Chapter 739, Statutes of 2018) to reduce GHG emissions in remaining pipeline gas and reduce methane emissions from organic waste.

[401] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF23, NF24, NF25, NF26, NF28. *finalejacrecs.pdf (arb.ca.gov)*.
[402] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. *finalejacrecs.pdf (arb.ca.gov)*.

Carbon Dioxide Removal and Capture

Climate Change 2022: Mitigation of Climate Change,[403] a report by the IPCC released in early 2022, states "The deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO_2 or GHG emissions are to be achieved. The scale and timing of deployment will depend on the trajectories of gross emission reductions in different sectors. Upscaling the deployment of CDR depends on developing effective approaches to address feasibility and sustainability constraints especially at large scales." In line with that report, this Scoping Plan considers CDR as a complement to technologically feasible and cost-effective GHG emissions mitigation, and the size of its role will depend on the degree of success in reducing GHG emissions at the source across the economy. [404] The modeling shows that emissions from the AB 32 GHG Inventory sources will continue to persist even if all fossil related combustion emissions are phased out. These residual emissions must be compensated for to achieve carbon neutrality. Options for CDR include both sequestration in natural and working lands and mechanical approaches like direct air capture. Chapter 2 provides estimates on how much CO_2 removal is possible by our natural and working lands and how much must be removed by mechanical CDR.

CCS, which is carbon capture from anthropogenic point sources, is described in Chapter 2 and involves capturing carbon from a smokestack of an emitting facility. Direct air capture, on the other hand, captures carbon directly from the atmosphere. Direct air capture technologies, unlike CCS, are not associated with any particular point source.

For this section, *carbon management* refers to the capture, movement, and sequestration of CO_2 through mechanical solutions for both capture at point sources and direct removal from the atmosphere through direct air capture.[405] Enabling policies and regulations across each of these steps are necessary for individual projects, and on a broader scale, for delivering reductions in support of the state's carbon neutrality and long-term carbon-negative goals. Figure 4-10 provides a graphic of the typical carbon management infrastructure.

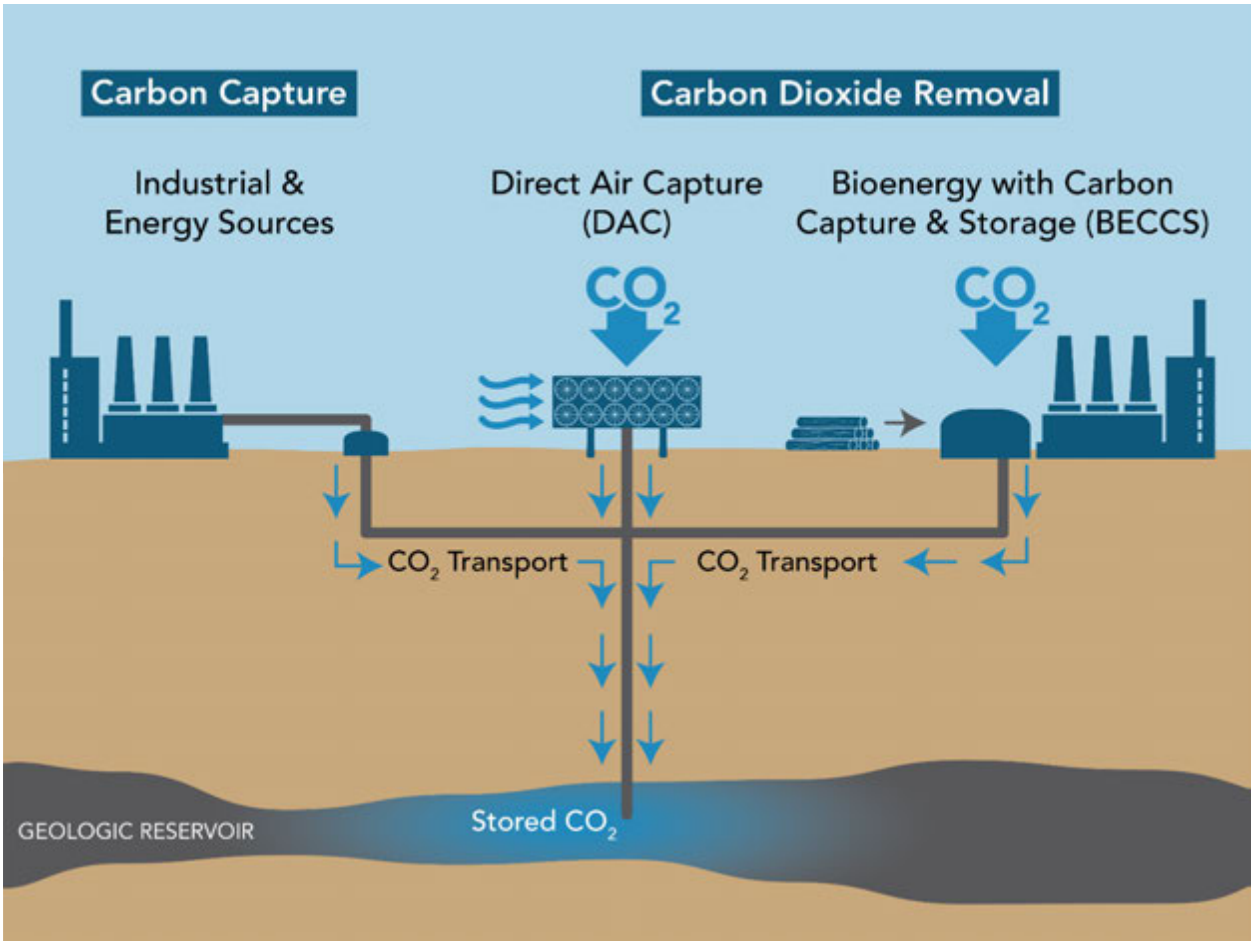
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[403] IPCC. 2022. *Climate Change 2022: Mitigation of Climate Change.* https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/.

[404] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.7. finalejacrecs.pdf (arb.ca.gov).

[405] CDR through natural and working lands is discussed in Chapter 2 and later in this chapter.

Figure 4-10: Carbon management infrastructure



Carbon dioxide removal directly from the atmosphere itself refers to a suite of carbon negative technologies that can be used to draw down ongoing and historical carbon emissions already in the atmosphere. Some CO_2 removal technologies leverage the abilities of both natural photosynthesis and mechanical removal by using biomass wastes as inputs to make low- or zero-carbon energy or fuels, all while capturing and storing produced CO_2.

Captured CO_2 from point sources or from the atmosphere is permanently stored in specialized geologic formations, typically half a mile or more underground. A recent Stanford University study estimated the state's commercial storage potential is nearly 70,000 million metric tons of CO_2, even when excluding oil and gas reservoirs.[406] California is well-positioned because few other places on the West Coast are suitable for

[406] Stanford Center for Carbon Storage. Opportunities and Challenges for CCS in California. https://sccs.stanford.edu/california-projects/opportunities-and-challenges-for-CCS-in-California.

geologic storage at scale. To inform discussion around CO_2 removal, CARB held two full-day workshops exploring the types of options for carbon capture and geologic storage and utilization in products.[407,408,409]

The modeling results provided in Chapter 2 demonstrate the targeted need for CCS on large facilities such as refineries and cement. The CCS numbers do not include the potential additional applications for producing hydrogen with biomethane, other manufacturing, electricity, or other bioenergy. If CCS is not deployed, those emissions would be released directly into the atmosphere and instead need to be addressed through CDR to achieve carbon neutrality. Although a study finds California has 76 existing electricity and industrial facilities that are suitable candidates for CCS retrofit,[410] this Scoping Plan proposes a targeted role for this technology such that it would only be used to address sectors where non-combustion options are not technologically feasible or cost-effective at this time, to the extent needed to achieve the 85 percent reduction in anthropogenic emissions as called for in AB 1279. In future updates to the Scoping Plan, there may be additional options for technologically feasible or cost-effective technologies that may be deployed, which would further reduce the need for CCS and CDR except in situations to address historical GHG emissions.

Recognizing the need for carbon capture and utilization sequestration and removal, the Legislature passed, and the governor signed, SB 905. It includes several key requirements in the development of the state's Carbon Capture Removal, Utilization, and Storage Program. The following is a summary of the work to be completed to establish and administer this program. Many of these steps will address the need to evaluate the safety and efficacy of actions to support carbon removal, sequestration, and transfer via pipelines. Note that not all of these actions are under CARB's authority.

- Review technology to evaluate efficacy, safety, viability of CCUS/CDR methodologies.
- Develop monitoring and reporting requirements and schedules.
- Develop a unified permit application.
- Develop financial responsibility requirements.
- Develop a centralized public database for project status.

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[407] CARB. December 11, 2019. Carbon Neutrality Meetings & Workshops. *https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality/carbon-neutrality-meetings-workshops*.
[408] CARB. August 2, 2021 Scoping Plan Meetings & Workshops. *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops*.
[409] *Carbon utilization* refers to the use of captured carbon to produce products such as plastics and concrete.
[410] Glenwright, Kara. 2020. *Roadmap for carbon capture and storage in California.* Precourt Institute for Energy. *https://earth.stanford.edu/news/roadmap-carbon-capture-and-storage-california#gs.ysj78q.*

- Consult with CNRA on pore space requirements as CNRA develops a framework for pore space governing agreements.
- Establish a Geologic Carbon Sequestration Group to identify suitable injection well locations, subsurface monitoring, and potential hazards that may require suspension of injection.

SB 905 also has requirements for project developers such as to develop monitoring plans and to avoid any adverse health and environmental impacts at the carbon capture location—or mitigation of unavoidable impacts as required under existing requirements. For the site of injection, there are requirements for site stability, monitoring, and reporting plans. SB 905 also bans CCS with enhanced oil recovery in California and prohibits the transfer of CO_2 via pipeline until the U.S. Department of Transportation's Pipelines and Hazardous Materials Safety Administration (PHMSA) completes its current rulemaking to update existing CO_2 pipeline safety requirements.

An often-cited example of pipeline concerns involves a CO_2 pipeline in Mississippi. On February 22, 2020, a CO_2 pipeline operated by Denbury Gulf Coast Pipelines LLC (Denbury) ruptured in proximity to the community of Satartia, Mississippi. The rupture followed heavy rains that resulted in a landslide, creating excessive axial strain on a pipeline weld (DOT 2022). The combination of weather and topography resulted in a slower dissipation of the gas. The pipeline was also carrying hydrogen sulfide, a flammable and toxic gas. The pipeline failed on a steep embankment, which had recently subsided. Heavy rains are believed to have led to a landslide, which created axial strain on the pipeline and resulted in a full circumferential girth weld failure. The PHMSA investigation also revealed several contributing factors to the accident, including but not limited to: Denbury not addressing the risks of geohazards in its plans and procedures, underestimating the potential affected areas that could be impacted by a release in its CO_2 dispersion model, and not notifying local responders to advise them of a potential failure.

As the Satartia example highlights, appropriate pipeline safety and environmental standards in California are critical to minimize any risks from CO_2 transport in the future. As such, SB 905 also tasks CNRA, in consultation with the Public Utilities Commission, to, no later than February 1, 2023, provide a proposal to the Legislature to establish a state framework and standards for the design, operation, siting, and maintenance of intrastate pipelines carrying CO_2 fluids of varying composition and phase to minimize the risk posed to public and environmental health and safety. The recommended framework shall be designed to minimize risk to public health and environmental health and safety, to the extent feasible. Because SB 905 prohibits the transfer of CO_2 via pipeline until the PHMSA completes its current rulemaking to update existing CO_2 pipeline safety requirements, CCS or CDR projects that would require a pipeline to transfer CO_2 are not feasible at this time within California.

Ultimately, and in accordance with SB 905, the merits of each CCS or CDR project must be evaluated on a case-by-case basis.[411] Deployment of CCS and CDR could support skilled jobs and workforces, including those in traditional fossil energy communities. Other co-benefits could include criteria air pollutant reductions and water production. It will be important to design projects that do not exacerbate community health impacts, include early and ongoing community engagement, and are in compliance with local, state, and federal public health and environmental protection laws. It also should be noted that, as these types of projects are an emerging area of governance, additional coordination and discussion will be needed among the various levels of authorities involved. SB 905 has already initiated this process by assigning specific agencies with tasks related to their expertise and authority.

Chapter 2 includes a more detailed discussion about the proposed role of CO_2 removal in this Scoping Plan.

Sector Transition

State,[412] national,[413,414] and global decarbonization analyses[415] indicate a significant role for carbon management infrastructure, yet relatively few projects are operational. Around the world, about two dozen large CCS projects are capturing tens of millions of metric tons of CO_2 each year, with about a dozen operating in the United States.[416] The vast majority of capacity is at industrial facilities, such as ethanol and fertilizer plants, that would otherwise vent nearly pure CO_2 into the atmosphere as a by-product of normal, non-combustion processes. Future research, development, and demonstration projects must refine and commercialize capture systems for more complex applications, especially

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[411] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.5. *finalejacrecs.pdf (arb.ca.gov)*.
[412] E3. October 2020. Achieving Carbon Neutrality in California Report: Final Presentation. *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_presentation_oct2020_2.pdf*.
[413] World Resources Institute. January 31, 2020. CarbonShot: Federal Policy Options for Carbon Removal in the United States. Working paper. *https://www.wri.org/research/carbonshot-federal-policy-options-carbon-removal-united-states*.
[414] C2ES. No date. Getting to Zero: A U.S. Climate Agenda — Center for Climate and Energy Solutions. *https://www.c2es.org/getting-to-zero-a-u-s-climate-agenda-report/*.
[415] IPCC. Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. Chapter 2. *https://www.ipcc.ch/sr15/chapter/chapter-2/*. All analyzed pathways limiting warming to 1.5°C with no or limited overshoot use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net negative emissions to return global warming to 1.5°C following a peak (high confidence). The longer the delay in reducing CO_2 emissions toward zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net negative emissions after mid-century to return warming to 1.5°C (high confidence).
[416] Congressional Research Service. 2021. Carbon Capture and Sequestration (CCS) in the United States. R44902. *https://crsreports.congress.gov/product/pdf/R/R44902?msclkid=e45e0012c25911ec8085ca575cb61e82*.

for those with limited decarbonization options. It has only been in the last few years that attention has seriously turned to mechanical CDR. As new information and modeling on climate change have been made available, the science has become clearer that avoiding the most catastrophic impacts of climate change requires both reducing emissions and deploying mechanical CDR.

California is paving a path forward on a science-based carbon management infrastructure policy that can serve as an example for other jurisdictions. The LCFS, which reduces the carbon intensity of transportation fuels, includes a protocol for select carbon management projects to become certified and generate LCFS credits.[417] CCS is not a new concept or technology. Twenty years of CCS testing show it is a safe and reliable tool.[418] As mentioned in Chapter 2, while no new CCS projects have been implemented or generated any credits under the CARB CCS protocol, CCS projects have been implemented elsewhere since the 1970s. Moreover, there has been a U.S. Department of Energy CCS research program underway for more than two decades. These all form a foundation of information for future efforts. Certified projects must successfully demonstrate adherence to rigorous pre-construction, operational, and site closure standards designed to strengthen environmental performance, as described in CARB's CCS Protocol. The protocol is designed to layer on top of existing federal carbon sequestration regulations designed to protect the environment. The protocol would need to be reevaluated if CCS were to be more broadly applied across sectors beyond transportation fuel production.

Direct air capture and carbon mineralization have high potential capacity for removing carbon, but direct air capture is currently limited by high cost. Carbon mineralization may also have high potential for removing carbon from the atmosphere, but understanding of the technology is still limited.[419] Direct air capture could also be deployed at higher rates to remove legacy GHG emissions from the atmosphere. Chapter 2 contains additional information on the current status of CCS and mechanical CDR projects globally, as well as federal support of such technologies.

Strategies for Achieving Success

- Implement SB 905.

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[417] CARB. 2018. Carbon Capture and Sequestration Protocol under the Low Carbon Fuel Standard. August 13. *https://ww2.arb.ca.gov/sites/default/files/2020-03/CCS_Protocol_Under_LCFS_8-13-18_ada.pdf*.

[418] National Energy Technology Laboratory. Permanence and Safety of CCS. *https://netl.doe.gov/coal/carbon-storage/faqs/permanence-safety*.

[419] Aines, Roger. No date. Options for Removing CO_2 from California's Air. Lawrence Livermore National Laboratory. *https://ww2.arb.ca.gov/sites/default/files/2021-08/llnl_presentation_sp_engineeredcarbonremoval_august2021.pdf*.

- Convene a multi-agency Carbon Capture and Sequestration Group comprised of federal, state, and local agencies to engage with environmental justice advocates, tribes, academics, researchers, and community representatives to identify the current status, concerns, and outstanding questions concerning CCS, and develop a process to engage with communities to understand specific concerns and consider guardrails to ensure safe and effective deployment of CCS.[420]
- Iteratively update the CARB CCS Protocol with the best available science and implementation experience.
- Incorporate CCS into other sectors and programs beyond transportation where cost-effective and technologically feasible options are not currently available and to achieve the 85 percent reduction in anthropogenic sources below 1990 levels as called for in AB 1279.
- Evaluate and propose, as appropriate, financing mechanisms and incentives to address market barriers for CCS and CDR.
- Evaluate and propose, as appropriate, the role for CCS in cement decarbonization (SB 596) and as part of hydrogen production pathways (SB 1075).
- Support carbon management infrastructure projects through core CEC research, development, and demonstration (RD&D) programs.
- Continue to explore carbon capture applications for producing or leveraging zero-carbon power for reliability needs as part of SB 100.
- Consider carbon capture infrastructure when developing hydrogen roadmaps and strategy, especially for non-electrolysis hydrogen production.
- Evaluate and streamline permitting barriers to project implementation while protecting public health and the environment.
- Explore options for how local air quality benefits can be achieved when CCS is deployed.
- Explore opportunities for CCS and CDR developers to leverage existing infrastructure, including subsurface infrastructure.
- Explore permitting options to allow for scaling the number of sources at carbon sequestration hubs.

Short-Lived Climate Pollutants (Non-Combustion Gases)

Short-lived climate pollutants (SLCPs) include black carbon (soot), methane (CH_4), and fluorinated gases (F-gases, including hydrofluorocarbons [HFCs]). They are powerful climate forcers and harmful air pollutants that have an outsized impact on climate change

[420] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.9. *finalejacrecs.pdf (arb.ca.gov)*.

in the near term, compared to longer-lived GHGs, such as CO_2. According to the IPCC's *Climate Change 2021: The Physical Science Basis,* in the near-term (i.e., 10- to 20-year time scale) the warming influence of all SLCPs combined will be at least as large as that of CO_2.[421] The United Nations Environment Programme's Global Methane Assessment[422] advises that achieving the least-cost pathways to limit warming to 1.5°C requires global methane emission reductions of 40–45 percent by 2030 alongside substantial simultaneous reductions of all climate forcers, including CO_2 and SLCPs. Action to reduce these powerful emissions sources today will provide immediate benefits—both to human health locally and to reduce warming globally—as the effects of our policies to transition to low carbon energy systems and achieve carbon neutrality further unfold.

In 2017, the Board approved the comprehensive Short-Lived Climate Pollutant Reduction Strategy (Strategy).[423] This strategy explained how the state would meet the following SB 1383-established targets:

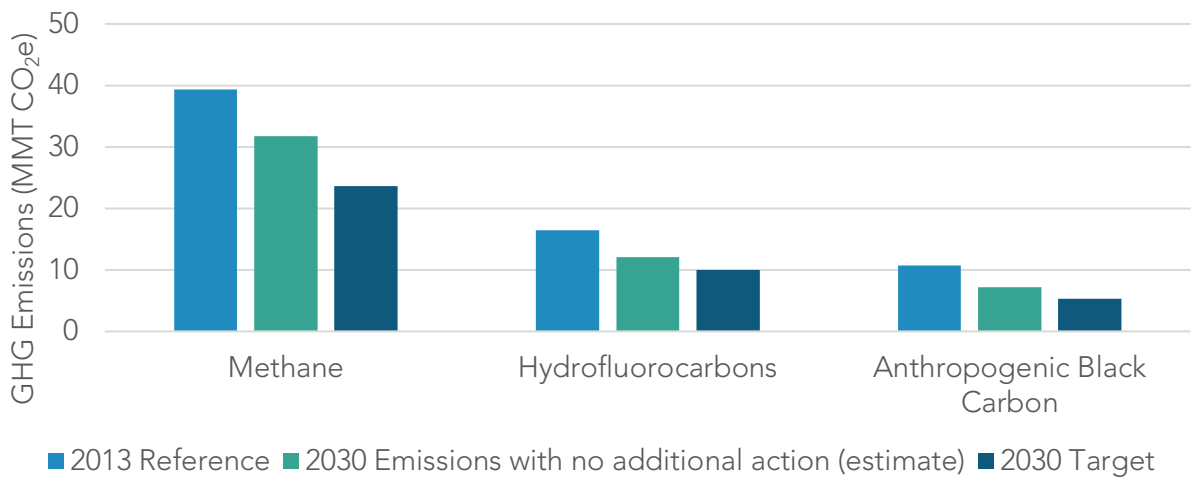
- 40 percent reduction in total methane emissions[424] (including a separate 40 percent reduction in dairy and livestock emissions)
- 40 percent reduction in hydrofluorocarbon gas emissions
- 50 percent reduction in anthropogenic black carbon emissions
- 50 percent reduction of organic waste disposal from 2014 levels by 2020, and 75 percent by 2025, including recovery of at least 20 percent of edible food for human consumption

The state is expected to achieve roughly half of the SB 1383 targeted emissions reductions by 2030 through strategies currently in place (See Figure 4-11). As directed by the Legislature under SB 1383, state agencies focused on voluntary, incentive-based mechanisms to reduce SLCP emissions in the early years of implementation to overcome technical and market barriers. Under this "carrot-then-stick" strategy, incentives are replaced with requirements as the solutions become increasingly feasible and cost-effective. To meet legislated targets, more aggressive action is needed.

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[421] IPCC. 2021. *Climate Change 2021:The Physical Science Basis. https://www.ipcc.ch/report/ar6/wg1/*.
[422] United Nations. Global Methane Assessment. Summary for Policymakers. *https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf*.
[423] CARB. 2017. Short-Lived Climate Pollution Reduction Strategy. *https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf*.
[424] All SB 1383 emissions reductions are mandated to be realized by 2030 and are relative to 2013 levels.

Figure 4-11: Expected progress toward SB 1383 targeted emissions reductions by 2030 through strategies currently in place



While the state's overall GHG emissions have declined by 9 percent over the past decade, SLCP emissions reductions have not kept pace with broader progress toward decarbonization. After growing steadily in the preceding decade, methane emissions have remained relatively flat since 2013.

HFCs are the fastest growing source of GHG emissions, primarily driven by their use to replace ozone-depleting substances and an increased demand for cooling and refrigeration.[425] Since 2005, statewide HFC emissions have more than doubled. While the rate of increase has slowed in recent years due to the state's measures, HFC emissions are still on the rise in California, and have grown by over 50 percent since 2010.[426] Globally, as temperatures rise, adoption of cooling technologies (and refrigerants) is increasing rapidly. If no measures are taken, it is estimated that HFCs will account for 9 to 19 percent of the total global GHG emissions by 2050.[427]

[425] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.
[426] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.
[427] Velders, G. J., D. W. Fahey, J. S. Daniel, M. McFarland, and S. O. Andersen. 2009. "The large contribution of projected HFC emissions to future climate forcing." *Proceedings of the National Academy of Sciences* 106(27), 10949–10954.

Methane

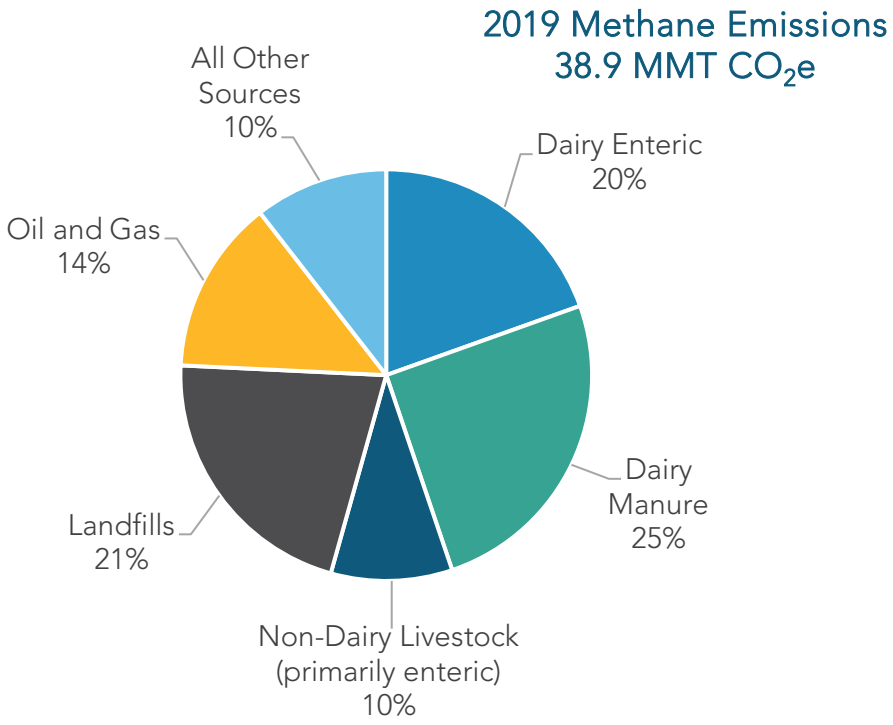
Human sources of methane emissions are estimated to be responsible for up to 25 percent of current warming.[428] Fortunately, methane's short atmospheric lifetime of ~12 years[429] means that emissions reductions will rapidly reduce concentrations in the atmosphere, slowing the pace of temperature rise in this decade. Further, a substantial portion of the targeted reductions can be achieved at low cost and will provide significant human health benefits. For example, the UN's *Global Methane Assessment* (2021)[430] found that over half of the available targeted measures have mitigation costs below $21/MTCO$_2$e, and that each million metric tons of methane reduced would prevent 1,430 premature deaths annually due to ozone pollution caused by methane.

Following the Twenty Sixth Conference of Parties (COP26) (the United Nations Convention on Climate Change in 2021), over 110 nations have signed onto the Global Methane Pledge (Pledge)[431] to limit methane emissions by 30 percent relative to 2020 levels. The Pledge covers countries that emit nearly half of all methane and make up 70 percent of global GDP. The UN's Global Methane Assessment[432] shows that human-caused methane emissions can be reduced by up to 45 percent this decade, which would avoid nearly 0.3°C of global warming by 2045.

As shown in Figure 4-12, the three largest sources of California's methane emissions are the dairy and livestock industry, landfills, and oil and gas systems.

[428] IPCC. 2021. *Climate Change 2021:The Physical Science Basis. https://www.ipcc.ch/report/ar6/wg1/.*
[429] In contrast, the lifetime of CO_2 is hundreds of years. The IPCC Third Assessment Report concluded that no single lifetime can be defined for CO_2 because of the different rates of uptake by different removal processes. According to IPCC Fourth Assessment Report, the majority of an increase in CO_2 will be removed from the atmosphere within decades to a few centuries, while the remaining 20 percent may stay in the atmosphere for many thousands of years.
[430] United Nations. 2021. Global Methane Assessment. *https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf*.
[431] Global Methane Pledge. *https://www.globalmethanepledge.org/*.
[432] United Nations Environment Programme. 2021. Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. *https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions?msclkid=00661370c85811eca078eb8fdbd603d1*.

Figure 4-12: Sources of California methane emissions (2019)



Emissions from dairy and livestock operations come from two main sources: (1) enteric fermentation and (2) manure management operations, especially at dairies that employ open anaerobic lagoons that allow methane to escape into the atmosphere. Landfills, the second largest source of methane emissions, produce methane from the decomposition of organic waste. Although approximately 95 percent of all the waste that has been disposed of in the state has been deposited in a landfill that is equipped with a gas collection and control system, as required by California's Landfill Methane Regulation,[433] a portion of the methane still escapes into the atmosphere. Fugitive methane emissions can be intermittent and highly variable, both seasonally and spatially, particularly at landfills. Research has shown that landfills are complex systems and a wide range of conditions (e.g., atmospheric, operational, biological, chemical, and physical) may contribute to variability in rates of organic waste degradation, methane generation, and capture efficiency, so reducing the amount of organics deposited in landfills is critical to reducing overall landfill methane emissions. And despite the variability in individual landfill emissions, landfill gas collection and control systems remain the most effective strategy

[433] CARB. Landfill Methane Regulation. https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation.

for reducing methane emissions from waste once it is placed in a landfill. Non-combustion methane emissions from the oil and gas sector are the third largest source of methane emissions in California. Almost three-quarters of the methane emissions from this sector come from leaks and venting from fossil gas transmission and distribution pipelines and equipment.

Hydrofluorocarbons

HFCs are synthetic GHGs that are powerful climate forcers. They are used mainly as refrigerants or heat transfer fluids in refrigeration, space conditioning, and heat pump equipment. Refrigerants are ubiquitous and are used everywhere from supermarkets, convenience stores, cold storage warehouses and wineries, to vending machines and residential and motor vehicle air-conditioners. Additionally, HFCs are also used as foam-blowing agents, solvents, aerosol-propellants, and fire suppressants. While HFCs remain in the atmosphere for a much shorter time than CO_2, the relative global warming potential (GWP) values of HFCs can be hundreds to thousands of times greater than CO_2. The mix of HFCs currently in use in California, weighted by usage (tonnage), have an average 100-year GWP of 1,700.[434] The average atmospheric lifetime of the mix of HFCs in use is 15 years.[435] Given the short average lifetimes, rapid reductions in HFC emissions can translate into near-term reductions in climate change effects.

As the global temperatures increase, the demand for cooling and refrigerants will continue to grow, as will the use of electric heat pumps to replace conventional fossil gas heating options. Unless addressed, continued use of high-GWP HFCs will perpetuate a feedback loop, where the cooling agents themselves cause additional warming.

In 2016, representatives from 197 nations signed the Kigali Amendment, which amended the existing Montreal Protocol (to reduce ozone-depleting substance production and consumption) to include a global phasedown in the production and consumption of HFCs beginning in 2019.[436] As of September 2022, 137 nations have either accepted, approved, or ratified the Kigali Amendment. On September 21, 2022, the U.S. Senate approved ratification of the Kigali Amendment, and it is expected that the United States

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[434] CARB. 2020. *Initial Statement of Reasons: Public Hearing to Consider the Proposed Amendments to the Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Chillers, Aerosols-Propellants, and Foam End-Uses Regulation.* October 20. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hfc2020/isor.pdf?_ga=2.164659835.592460318.1646664679-912670513.1542398285.

[435] Zhongming, Z., et al. 2011. *HFCs: A Critical Link in Protecting Climate and the Ozone Layer: A UNEP Synthesis Report.*

[436] United Nations Treaty Collection. Chapter XXVII, Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en.

will soon join the 137 nations that have already ratified.[437] In the United States, Congress enacted the federal *American Innovation and Manufacturing (AIM) Act* in December 2020.[438] The AIM Act authorizes the U.S. EPA to address HFCs in several ways, including a national HFC phasedown that nearly mirrors the schedule of the global phasedown under the Kigali amendment.[439]

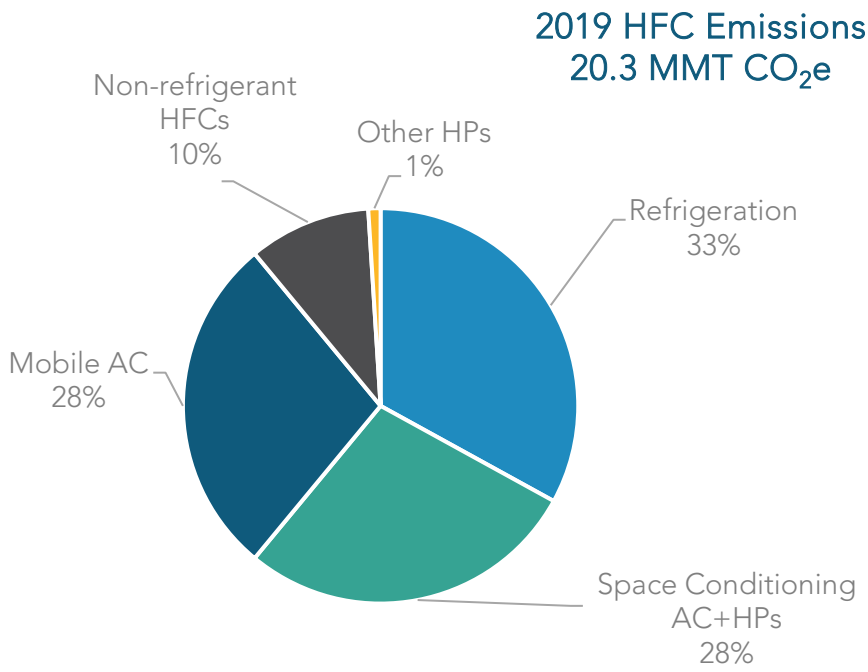
Nearly 90 percent of HFC emissions in California come from their use as refrigerants in the commercial, industrial, residential, and transportation sectors. The timescales over which the HFC emissions occur vary, depending on the type of application. Thus, strategies to reduce HFC emissions must be tailored by equipment type. CARB has several measures in place to tackle HFC emissions from the various sources shown in Figure 4-13 below. This includes the Refrigerant Management Program[440] that tracks and manages emissions from large commercial, industrial, and cold storage refrigeration facilities in the state. CARB has adopted regulations to reduce HFC emissions from consumer product aerosol propellants, semiconductor manufacturing, and small cans of automotive refrigerant.[441]

In 2018, California adopted HFC prohibitions via regulation and legislation for several sectors, including stationary refrigeration and foam end uses to backstop the partially vacated federal Significant New Alternatives Policy (SNAP) program.[442] Most recently, in 2020, CARB adopted additional measures that place GWP limits on refrigerants used in refrigeration and air conditioning equipment, which are the largest sources of HFC emissions, and are commonly used in residential, commercial, and industrial buildings. Additionally, CARB adopted a unique pilot program requiring the use of reclaimed refrigerant: the Refrigerant Recovery, Reclaim, and Reuse (R4) Program. The newly adopted HFC rules for the refrigeration and air conditioning sectors are the first of their kind in the nation.

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[437] U.S. Ratification of the Kigali Amendment - United States Department of State. *https://www.state.gov/u-s-ratification-of-the-kigali-amendment/*.
[438] 42 U.S.C § 7675, Pub. L. 116-260, § 103. *https://www.epa.gov/sites/default/files/2021-03/documents/aim_act_section_103_of_h.r._133_consolidated_appropriations_act_2021.pdf*.
[439] 42 U.S.C § 7675, Pub. L. 116-260, § 103.
[440] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[441] Contained in various sections, commencing with Cal. Code of Regs., tit. 13, §§ 1900 et seq.
[442] Cal. Code of Regs., tit. 17, §§ 95371, et seq.; California Cooling Act, Senate Bill 1013 (Lara, Stats. of 2018, Ch. 375, Health & Saf. Code § 39764).

Figure 4-13: Sources of hydrofluorocarbon (HFC) emissions (2019)

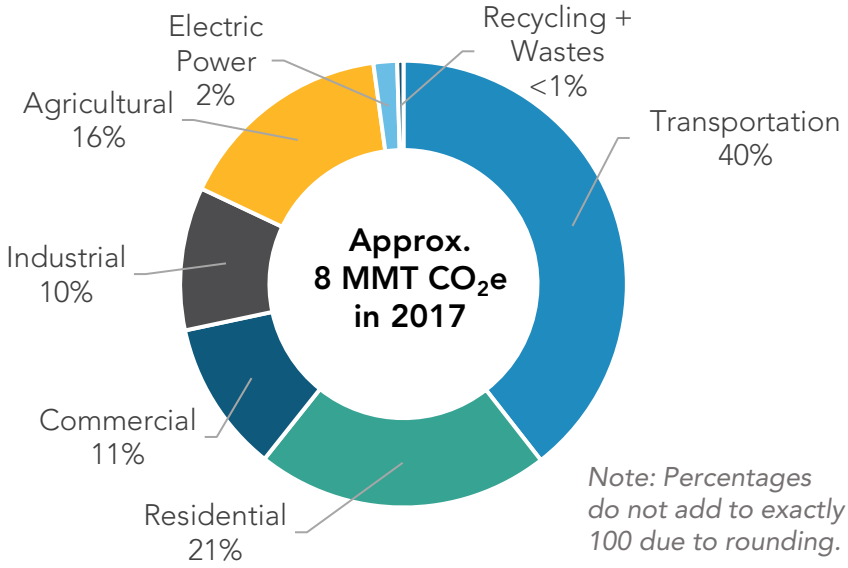


Anthropogenic Black Carbon

Black carbon is not included in AB 32 or the state's AB 32 GHG inventory that tracks progress toward the state's climate targets; however, it has been identified as a powerful climate forcer and is included California's Short-Lived Climate Pollutant Reduction Strategy. The majority of anthropogenic black carbon emissions come from transportation, specifically heavy-duty vehicles, and they have decreased since 2013 due to engine certification standards and in-use rules for on-road and off-road fleets, along with clean fuel requirements and incentives, including California Climate Investments and LCFS credits. Additionally, fuel combustion for residential, commercial, and industrial applications contribute significantly to overall black carbon emissions. Approximately 95 percent of residential black carbon emissions are due to wood combustion; these emissions are being reduced through programs like the Woodsmoke Reduction Program established by SB 563 (Lara, Chapter 671, Statutes of 2017). Alternatives to agricultural burning and policies that phase out agricultural burning will also result in agricultural black carbon emissions reductions. In 2021 CARB provided a preliminary estimate of 2017

black carbon emissions (Figure 4-14).[443] This estimate will be finalized as part of a future update to the Short-Lived Climate Pollutant Inventory.

Figure 4-14: Sources of anthropogenic black carbon (preliminary 2017 estimates; AR5 100-yr GWP 900)



Sector Transition

California has long recognized the importance of mitigating non-combustion SLCPs and took several early action measures as part of a comprehensive, ongoing program to reduce in-state GHG emissions under AB 32. The early action measures included CARB's Landfill Methane Regulation,[444] Refrigerant Management Program,[445] and Oil and Gas Methane Regulation.[446]

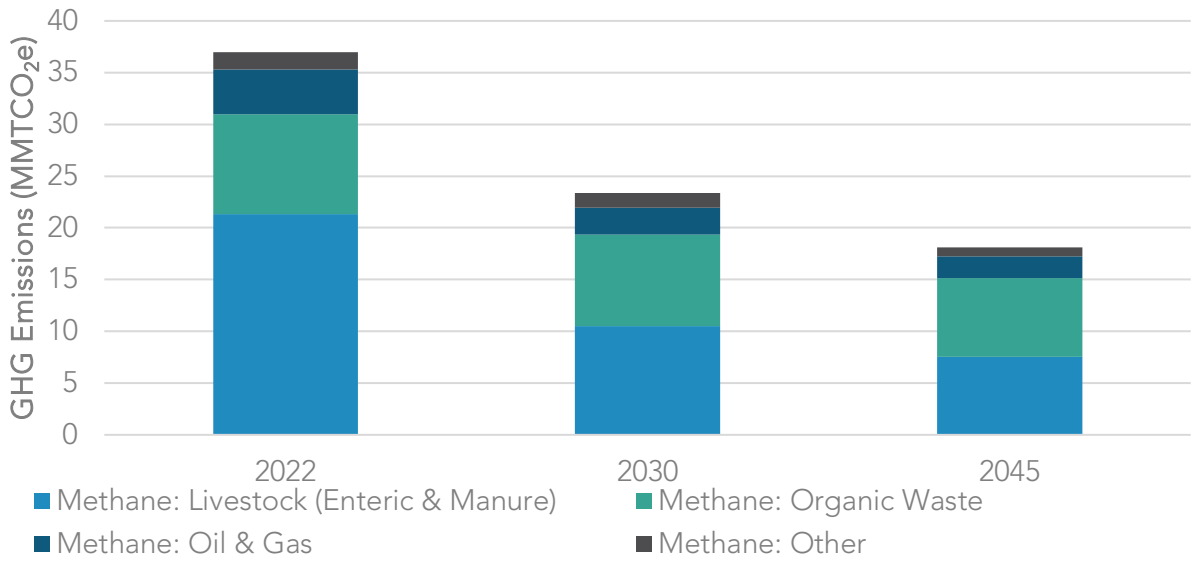
Methane

The methane abatement strategies currently in place are projected to achieve half of the methane emissions needed to meet the overall methane reduction target of SB 1383 (40 percent reduction by 2030). The reduction target translates to a limit of less than 24 MMTCO_2e in 2030 (Figure 4-15). It is anticipated that, since some sectors have fewer

[443] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation, September 8. https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf.
[444] Cal. Code of Regs., tit. 17, §§ 95460, et seq.
[445] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[446] Cal. Code of Regs., tit. 17, §§ 95665–77.

strategies that can be implemented to reduce methane in the near-term, other sectors will need to go beyond the 40 percent reduction to meet the target.

Figure 4-15: Methane emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario[447]



Dairy and Livestock Methane

California is the largest dairy-producing state, home to one in five U.S. dairy cows. To date, methane emissions reductions from the dairy and livestock sector have mainly been driven by a decreasing animal population and the growing adoption of manure management strategies, including anaerobic digesters and conversion to dry manure systems and pasture systems. CARB recently completed a detailed analysis of the emission reductions expected by 2030 and the estimated additional investment needed to reach the dairy and livestock sector methane reduction target. [448]

Assuming no adoption of additional manure management and enteric mitigations strategies beyond the projects that have committed funding, and a continued annual animal population decrease of 0.5 percent per year through 2030, further reductions of approximately 4.4 $MMTCO_2e$ will be needed to achieve the 2030 methane emissions reduction target for the sector set by SB 1383. If the remaining reductions are met through

[447] The *Organic Waste* category includes methane from landfills, wastewater treatment, and compost facilities.
[448] CARB. 2021. Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target. June. *https://ww2.arb.ca.gov/sites/default/files/2021-06/draft-2030-dairy-livestock-ch4-analysis.pdf*.

a mix of dairy projects in which half are dairy digesters and half are alternative manure management projects, then it is estimated that at least 420 additional projects will be necessary. Additional emissions reductions beyond this level will likely be necessary to ensure that the overall state methane emissions reduction targets are met.

Despite the considerable methane emissions mitigation potential of enteric strategies like feed additives, little progress has been made, as few products with proven mitigation potential have become commercially available, and unlike manure management strategies, there is a lack of financial incentives for their adoption.

Market conditions favoring farm consolidation and improved production efficiencies have driven reductions in the California and U.S. dairy population over the past decade. [449] These efficiency gains have allowed California to maintain production levels despite the decreasing population. If demand for dairy and beef products remains steady or increases, continued improvements in production efficiency and adoption of effective manure management and enteric mitigation strategies will be important to support dairy and livestock methane emission reductions.

Strategies for Achieving Success

- Install state of the art anaerobic digesters that maximize air and water quality protection, maximize biomethane capture, and direct biomethane to sectors that are hard to decarbonize or as a feedstock for energy.
- Increase alternative manure management projects, including but not limited to conversion to "solid," "dry," or "scrape" manure management; installation of a compost-bedded pack barn; an increase in the time animals spend on pasture; and implementation of solid-liquid separation technology into flush manure management systems.
- Implement enteric fermentation strategies that are cost-effective, scientifically proven, safe for animal and human health, and acceptable to consumers, and that do not impact animal productivity. Provide financial incentives for these strategies as needed.
- Accelerate demand for dairy and livestock product substitutes such as plant-based or cell-cultured dairy and livestock products to achieve reductions in animal populations.
- In consideration of pace of deployment of methane mitigation strategies and the scale of complimentary incentives, consider regulation development to ensure that the 2030 target is achieved, assuming the conditions outlined in SB 1383 are met.

[449] MacDonald, James M., Jonathan Law, and Roberto Mosheim. 2020. *Consolidation in U.S. Dairy Farming.* ERR-274. July. https://www.ers.usda.gov/webdocs/publications/98901/err-274.pdf.

Landfill Methane

Achieving the 75 percent organic waste disposal reduction target[450] of SB 1383, and maintaining that level of disposal in subsequent years, would bring annual landfill emissions in 2030 to just below the 2013 baseline. Annual methane emissions will be higher through 2030 than originally anticipated by the SLCP Strategy because the state did not achieve the anticipated reductions in organic waste disposal of 50 percent below 2014 levels by 2020. SB 1383 prohibited the organic disposal regulations from taking effect until 2022,[451] and, as a result, emissions have continued to increase.

Due to the multidecadal time frame required to break down landfilled organic material, the emissions reductions from diverting organic material in one year are realized over the course of several decades. For example, one year of waste diversion in 2030 is expected to avoid 8 $MMTCO_2e$ of landfill emissions, cumulatively, over the lifetime of that waste's decomposition.[452] Near-term diversion efforts are critical to avoid locking in future landfill methane emissions.

CalRecycle's 2020 report, *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals,*[453] estimated that 8 million short tons of composting and anerobic digestion capacity will be needed to manage organic wastes, above the existing and new capacity expected to be available by 2025. The 2019 report, *Co-Digestion Capacity in California,*[454] from the State Water Resources Control Board estimated that at least 2.4 million tons of digester capacity is available at urban wastewater treatment plants if sufficient incentives or funding for collection, receiving, and processing operations are provided to enable utilization of this capacity. The CPUC approved a decision in February 2022 implementing the biomethane procurement program, which will require investor-owned utilities by 2025 to procure 17.6 billion cubic feet (BCF) of biomethane produced from organic wastes to support the landfill disposal reduction and SLCP target and reduce fossil gas reliance for

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[450] The target is from 2014 levels by 2025.
Public Resources Code, § 42652.5. CalRecycle approved the SLCP: Organic Waste Reductions regulations (*https://calrecycle.ca.gov/organics/slcp/*) in 2020 and began implementing them in January 2022. These regulations are designed to achieve the 2025 disposal reduction and edible food recovery targets.

[452] The life cycle emissions reduction is based on anticipated diversion of 27 million short tons of organic waste from CalRecycle (2020) Analysis of the Progress Toward the SB 1383 Organic Waste Reduction Goals (*https://www2.calrecycle.ca.gov/Publications/Details/1693*). Under CalRecycle's SLCP regulations, an alternative to landfill disposal must achieve a life cycle GHG reduction of 0.3 $MTCO_2e$ per short ton of waste diverted.

[453] CalRecycle. 2020. *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals.* *https://www2.calrecycle.ca.gov/Publications/Details/1693*.

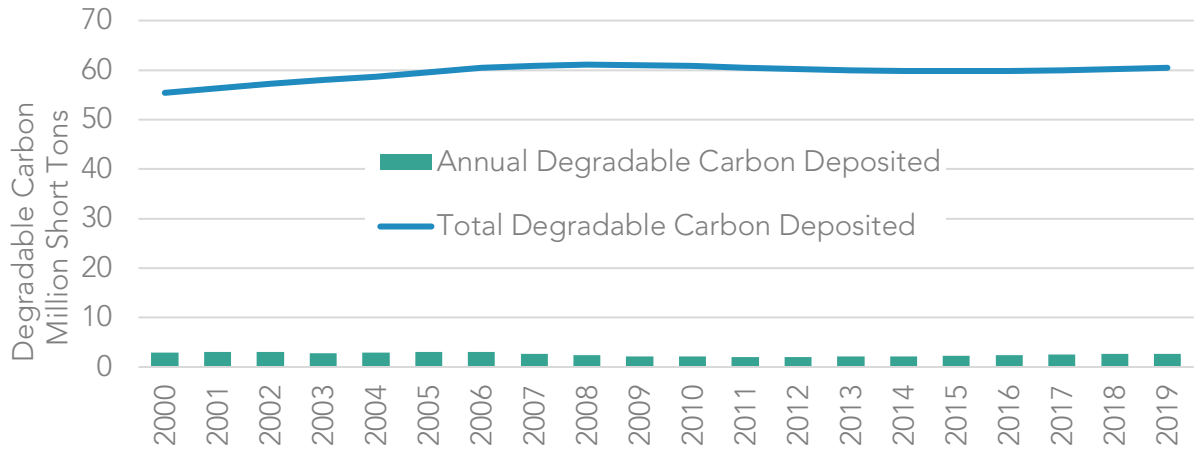
[454] State Water Resources Control Board. 2019. *Co-Digestion Capacity in California.* *https://www.waterboards.ca.gov/water_issues/programs/climate/docs/co_digestion/final_co_digestion_capacity_in_california_report_only.pdf*.

residential and commercial customers.[455] Additionally, the organic waste stream includes more than one million tons of edible food that could be recovered before it enters the waste stream through food rescue programs that combat hunger in communities throughout California.

While reducing organic waste disposal is the most effective means of achieving reductions in waste sector methane, strategies to reduce emissions from waste already in place in landfills also will play a role in achieving near-term reductions. As Figure 4-16 shows, the total degradable carbon (a measure of the amount of waste with potential to generate methane) that is accumulated from waste deposited in previous years is over 20 times greater than the amount added each year. This illustrates that even if we were able to entirely phase out landfilling of organic waste today, the existing waste in place at landfills would continue to generate methane for decades into the future.

Through a combination of improvements in operational practices, use of lower permeability covers, advanced landfill gas collection systems, and increased monitoring to detect and repair leaks, it is estimated that a direct emission reduction of 10 percent is achievable across the state's landfills by 2030. Technologies to utilize landfill gas efficiently can contribute further emission reductions in the energy sector.

Figure 4-16: Degradable carbon deposited in landfills



Strategies for Achieving Success

- Maximize existing infrastructure and expand it to reduce landfill disposal, with strategies including composting, anaerobic digestion, co-digestion at wastewater treatment plants, and other non-combustion conversion technologies.

[455] CPUC. 2022. Decision 22-02-025.

- Expand markets for products made from organic waste, including through recognition of the co-benefits of compost, biochar, and other products.[456]
- Recover edible food to combat food insecurity.
- Invest in the infrastructure needed to support growth in organic recycling capacity.
- Utilize existing digesters at wastewater treatment facilities to rapidly expand food waste digestion capacity.
- Direct biomethane captured from landfills and organic waste digesters to sectors that are hard to decarbonize.
- Implement improved technologies and best management practices at composting and digestion operations.
- Reduce emissions from landfills through improvements in operational practices, lower permeability covers, advanced collection systems, and technologies to utilize landfill gas.
- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks, improve understanding of the factors that lead to better capture efficiency, and explore new technologies and practices that can reliably improve methane control at landfills.

Upstream Oil and Gas Methane Reduction

For oil and gas production, processing, and storage, California is currently on track to achieve a 41 percent reduction in methane emissions by 2025 relative to 2013. The additional reductions needed to meet the 2030 target may be achieved by implementing additional regulatory requirements to further reduce intentional venting of fossil gas from equipment. If necessary, additional reductions from transmission and distribution facilities may be achieved by requiring the utilities to increase inspection and repair activities or further reduce emissions from pipeline blowdowns by implementing methods such as using portable compressors, using plugs to isolate sections of pipelines, flaring vented gas, routing gas to fuel gas systems, and installing static seals on compressor rods. Advances in methane detection technologies (e.g., satellites equipped to detect large methane sources) may also help to identify and mitigate methane emissions quickly across the oil and gas sector.

As California transitions away from fossil fuels, in-state oil and gas production will likely decline. This could result in an increase over time in the number of long-term idle and orphan wells (idle wells lacking a financially solvent, responsible owner) in the state. While California has regulations aimed at helping ensure operators manage their idle wells,

[456] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.4. *finalejacrecs.pdf (arb.ca.gov)*.

there could likely be an increase in California's orphan well population. Plugging all orphan wells, of which there are currently over 5,000, could take decades due to the limited resources California has for orphan well plugging. The benefits from plugging wells include methane emission reductions and job creation; employment gains from well plugging and site remediation activities could help temporarily offset job losses from the oil and gas industry. The California Council on Science and Technology's 2018 report on orphan wells, *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells,*[457] found that the potential cost to the state of plugging current orphan wells could be approximately $500 million, and the cost of plugging all active and idle wells could total over $9.1 billion. As oil and gas production in California declines due to reduced demand for fossil fuels, additional funding will likely be needed to cover the costs of plugging wells that have no viable operator.

Strategies for Achieving Success

- Mitigate emissions from leaks by regular leak detection and repair (LDAR) surveys at all facilities.
- Replace high emitting equipment with zero emission alternatives wherever feasible.[458]
- Have CARB and CalGEM lead a Task Force to identify and address methane leaks from oil infrastructure near communities.
- Pursuant to SB 1137, develop leak detection and repair plans for facilities in health protection zones, implement emission detection system standards, and provide public access to emissions data.
- Minimize emissions from equipment that must vent fossil gas by design (e.g., fossil gas powered compressors).
- Install vapor collection systems on high emitting equipment.
- Phase out venting and routine flaring of associated gas (gas produced as a by-product during oil production).
- Continuous ambient monitoring at fossil gas underground storage facilities to quickly detect large methane sources.
- Reduce pipeline and compressor blowdown emissions.

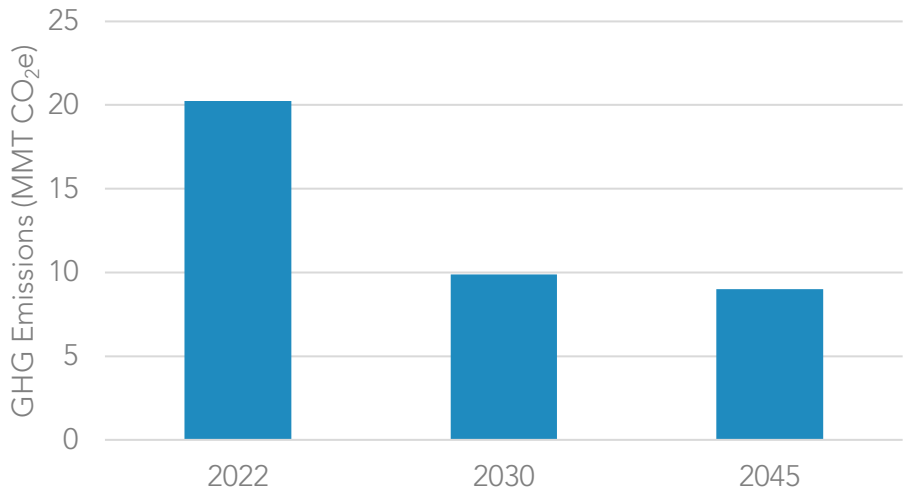
[457] The California Council on Science and Technology. 2018. *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells.* *https://ccst.us/wp-content/uploads/CCST-Orphan-Wells-in-California-An-Initial-Assessment.pdf*.
[458] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, P5. *finalejacrecs.pdf (arb.ca.gov)*.

- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks.[459]

Hydrofluorocarbons

In California, all the HFC measures currently in place will help achieve more than 70 percent of the reductions needed to achieve the 2030 HFC goal and provide very significant emissions reductions by 2045 and beyond. However, new targeted measures will be needed to maintain the pace of reductions, as demand for technologies that currently predominantly use high-GWP refrigerants is anticipated to grow. Despite decarbonization efforts, high-GWP HFCs are expected to be among the last remaining persistent GHG emission sources, as shown in Figure 4-17.[460]

Figure 4-17: Hydrofluorocarbon emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario



HFC emissions from new and existing sources should be addressed in tandem with building decarbonization efforts to maximize reductions.[461] As buildings are electrified in an effort to decarbonize them, the use of heat pumps for space conditioning, water heaters, and clothes dryers is expected to increase significantly. Heat pumps, while using

[459] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, CC17. *finalejacrecs.pdf (arb.ca.gov)*.
[460] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality. https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf*.
[461] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. *finalejacrecs.pdf (arb.ca.gov)*.

electricity, not fossil gas, currently rely predominantly on high-GWP refrigerants. Very low- or no-GWP technologies and solutions are either available or emerging for various heat pump technologies, and likely to develop further as international efforts to mitigate HFCs continue. However, most of these technologies are still nascent in the United States. In addition, some of the alternatives cannot be used until California building codes are updated, which is currently expected at the earliest in mid-2024 for some technologies based on the recently adopted provisions in AB 209[462] requiring the California Building Standards Commission to adopt the latest safety standards for refrigerant containing equipment into California's building codes. The current updates to the building codes will allow the use of many refrigerants with lower GWPs than HFCs currently in use. However, additional building code updates are needed to expand the choices of ultra-low-GWP alternatives, and that will need to happen in the next few years. The adoption of low-GWP refrigerants must occur in parallel with building decarbonization efforts; without such efforts, the vast GHG benefits of the latter will be partially offset, and the proportion of HFC emissions from buildings will continue to grow.

Leaks from existing air conditioning and refrigeration equipment are a major source of statewide and global HFC emissions. Once installed, refrigeration and air conditioning equipment can stay in place for decades, while leaking refrigerants into the atmosphere. This makes it very important that new installed equipment use refrigerants with a GWP as low as possible. The refrigerants inside existing equipment are sometimes collectively referred to as the *installed base* or *banks* of potential HFC emissions. If released spontaneously, the existing HFC banks would equal 60 percent of all annual statewide GHG emissions in California, as illustrated in Figure 4-18.[463]

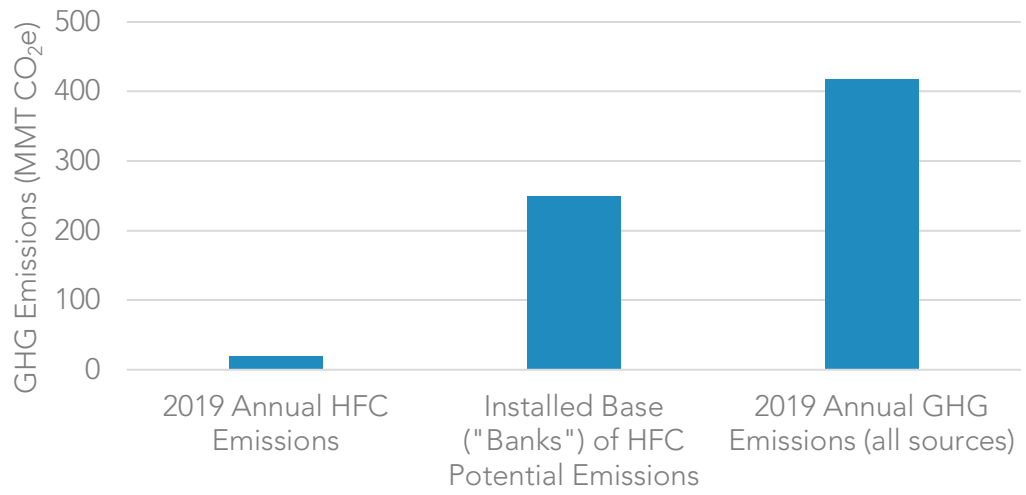
The sales prohibitions on newly produced refrigerants set forth in SB 1206 (2022) and the national/international HFC phasedown will help in reducing HFC emissions from existing equipment by restricting the supply of and increasing the value of existing high-GWP HFCs, thus enabling a circular economy. In the 2022–2023 state budget, CARB received $45 million in incentive funding for climate-friendly refrigerant technologies; this funding will be critical in shifting the market toward the best available refrigerant technologies in various sectors.

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[462] AB 209: Energy and climate change. *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.*

[463] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation. September 8. *https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf*.

Figure 4-18: Potential emissions from refrigerants in existing equipment



Strategies for Achieving Success

- Expand the use of very low- or no-GWP technologies in all HFC end-use sectors, including emerging sectors, like heat pumps for applications other than space conditioning, to maximize the benefits of building decarbonization.[464]
- Convert large HFC emitters such as existing refrigeration systems to the lowest practical GWP technologies.[465]
- Prioritize small-scale and independent grocers serving priority populations in addressing existing "banks" of high-GWP refrigerants.[466]
- Improve recovery, reclamation, and reuse of refrigerants by limiting sales of new or virgin high-GWP refrigerants and requiring the use of reclaimed refrigerants where appropriate.[467]
- Assist low-income and disadvantaged communities in obtaining low-GWP space conditioning units to protect vulnerable communities from heat stress and wildfire smoke.[468]

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[464] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. *finalejacrecs.pdf (arb.ca.gov)*.
[465] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. *finalejacrecs.pdf (arb.ca.gov)*.
[466] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT5 and JT6. *finalejacrecs.pdf (arb.ca.gov)*.
[467] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT1. *finalejacrecs.pdf (arb.ca.gov)*.
[468] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF28, JT5, and JT6. *finalejacrecs.pdf (arb.ca.gov)*.

- Accelerate technology transitions in California and the U.S. overall by collaborating with international partners committed to taking action on HFCs under the Kigali Amendment to the Montreal Protocol; this includes addressing barriers to adoption of very low- or no-GWP refrigerant technologies such as high upfront costs, shortage of trained technicians, and lag in updating safety standards and building codes.

Anthropogenic Black Carbon

Significant progress has been made since 2013 to reduce anthropogenic black carbon emissions, primarily from decreased combustion of distillate fuels in the agricultural sector, as well as improvements to provide cleaner, on-road combustion technologies. Under current strategies, anthropogenic black carbon from transportation is expected to be reduced by over 60 percent in 2030. Continued reductions in combustion emissions across all sectors from both the state's climate and air quality programs will also help reduce anthropogenic black carbon emissions going forward.

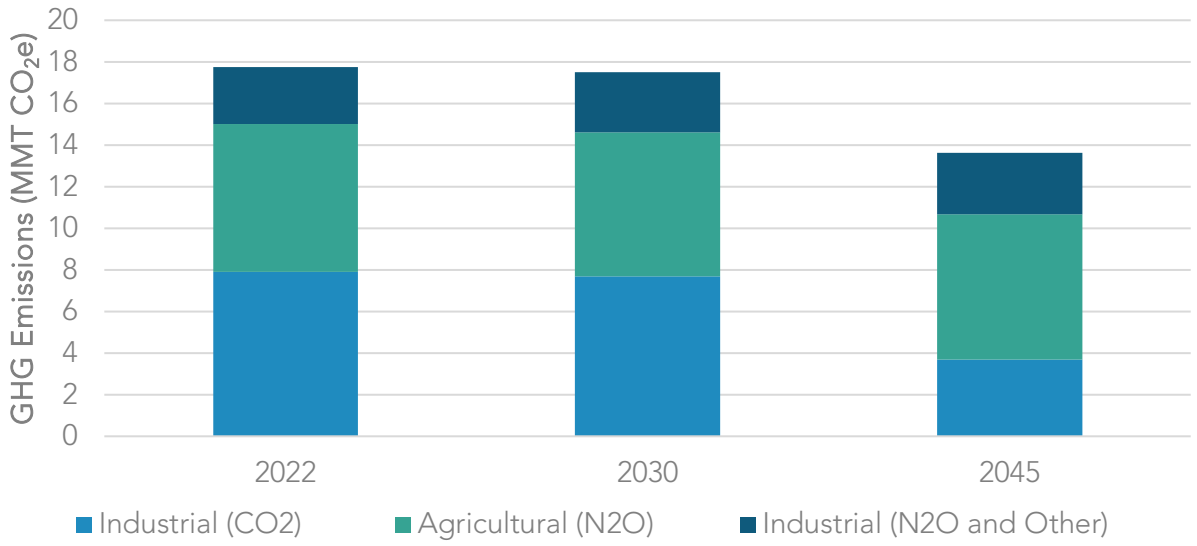
Strategies for Achieving Success

- Reduce fuel combustion commensurate with state's climate and air quality programs, particularly from reductions in transportation emissions and agricultural equipment emissions.[469]
- Invest in residential woodsmoke reduction.

In addition to SLCP emissions, some remaining non-combustion emissions are anticipated to persist in the coming decades, as shown in Figure 4-19. These include CO_2 from industrial processes such as cement manufacturing, oil and gas extraction, and geothermal electric power; N_2O from wastewater treatment, fertilizers, and livestock manure applied to agricultural soils; and other industrial, non-HFC GHG emissions.

[469] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A and Appendix A (Table Summary of Direct Emission Reduction Strategies). "Emissions reductions from energy consumed by California's agricultural sector, including post-harvest processing, use of tractors and other farm equipment, and water import and irrigation." *finalejacrecs.pdf (arb.ca.gov)*.

Figure 4-19: Remaining non-combustion emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario



Natural and Working Lands

California's natural and working lands (NWL) cover approximately 90 percent of the state's 105 million acres,[470] and include forests, grasslands, shrublands and chaparral, croplands, wetlands, sparsely vegetated lands, and the green spaces in urban and built environments. These lands include California Native American tribes' ancestral and cultural lands, parks and green spaces in our cities and communities, and the waters and the iconic landscapes we know and love. The diverse landscapes and biodiversity found throughout California's NWL provide a multitude of benefits to the people of California, including clean water, clean air, biodiversity, food, economic prosperity, recreational opportunities, continuation of traditional tribal ways of life, mental health benefits, and many others.

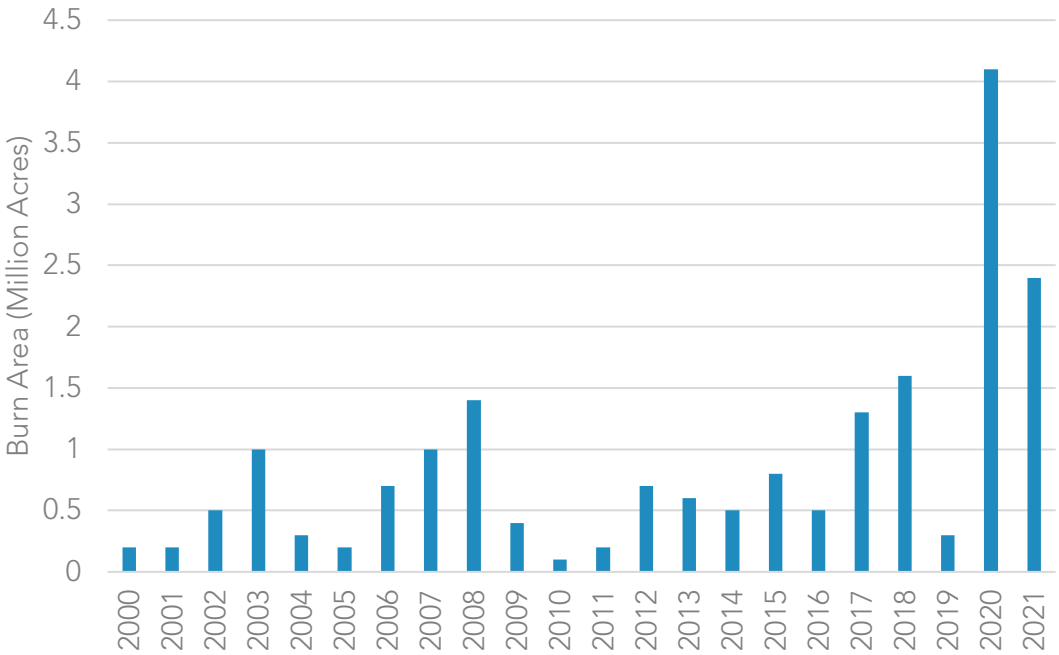
Our lands are a critical sector in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric CO_2. Healthy lands also can reduce emissions of powerful SLCPs, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Creation of healthy lands through

[470] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

multi-benefit and mitigation measures can also support tribal and local traditional lifeways. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts.

Climate change impacts have become more apparent in recent years and are having significant effects on communities throughout the state. One of these impacts is the much more frequent occurrence of unusually large, high-severity wildfires, which are being driven by climate change and by a recent history of fire-exclusion and land management practices that have resulted in forests with high levels of biomass. These recent large and high-severity wildfires have resulted in a significant amount of burned acreage and emissions in California (Figure 4-20).[471]

Figure 4-20: Acreage of burned wildland vegetation area



These wildfires deviate from the lower-severity fires that previously occurred at frequent intervals, around which California's forests evolved. As climate change accelerates, these large, uncharacteristic wildfires are likely to become more common and impact more of our landscapes. Climate change is also expected to have other significant effects on our lands, including more extreme droughts, floods, extreme heat, and the spread of invasive aquatic and terrestrial species, pests, diseases, and parasites. These impacts can lead

[471] CARB. 2022. Wildfire Emission Estimates for 2021. *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/Wildfire%20Emission%20Estimates%202000-2021.pdf*.

to negative feedback loops on human and ecological health; for example, increasing the spread of invasive species can lead to increases in pesticide use, if not managed through regulation or mitigation, which can pose risks to human health and the environment.

California's approach to climate action in the NWL sector is not solely focused on maximizing carbon stocks but instead on supporting carbon management that holistically fosters ecosystem health, resilience, provision of overall climate function, and other co-benefits.

Natural systems operate on a longer timescale than the energy and industrial sectors, and benefits from climate action on our lands can take decades to accrue. Scaling climate smart land management in California requires taking action now and playing the "long game" by establishing and maintaining consistent, patient approaches and programs.

Landscapes

For the first time, this Scoping Plan includes modeling for the NWL sector. The focus of the initial modeling is limited to seven land types that align with the those in the NWL Climate Smart Strategy.[472] Work will continue to incorporate more landscapes and management practices into the modeling over time. The initial landscapes included in the modeling for this Scoping Plan are:

- Forests
- Shrublands and Chapparal
- Grasslands
- Croplands
- Wetlands
- Developed Lands
- Sparsely Vegetated Lands

Each of these land types are a key component to the state's approach to increasing climate action in the NWL sector, as called for in Executive Order N-82-20 and AB 1757.[473] The Executive Order directs CARB to update the target for this sector in support of carbon neutrality by 2045 as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy. AB 1757 calls for the development of an

[472] CNRA. 2022. *Natural and Working Lands Climate Smart Strategy. Appendix B.* *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/Appendix-B_04132022_ada.pdf*.

[473] AB 1757 California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1757*.

ambitious range of targets for the NWL sector to be integrated into the Scoping Plan and other state policies. It directs CARB and CNRA to work closely together to update the NWL Climate Smart Strategy, and establish an expert advisory committee to inform and advise on NWL modeling, targets, and implementation strategies.[474] Additionally, in 2021, the governor signed SB 27[475] (Skinner, Chapter 237, Statutes of 2021) into law. It directed CARB to establish CO_2 removal targets for 2030 and beyond and take into consideration the NWL Climate Smart Strategy. The governor's Executive Order, AB 1757, and SB 27 go beyond previous direction from the Legislature and past administrations. These directives emphasize the importance of quantifying land-based carbon both statewide,[476] and in programs and policies,[477] setting targets[478] for NWL to support the state's climate objectives, and advancing land management actions[479] that support the health and resiliency of these lands.

Blue carbon (also known as carbon captured and held in coastal vegetation and soils, such as seagrasses, seaweeds, and wetlands)—is also important to consider as we look at long-term climate goals. While this landscape is not currently covered by IPCC inventory guidelines or included in California's NWL Inventory, the United States was the first nation to include blue carbon in its national GHG emissions inventory. California's Ocean Protection Council and San Francisco Estuary Institute are partnering to create a new coastal wetlands, beaches, and watersheds inventory. CARB staff will utilize information from this effort and assess other available data to evaluate how this landscape may be integrated into our efforts in the future as more data become available.[480]

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[474] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N20. *finalejacrecs.pdf (arb.ca.gov)*.
[475] SB 27 Carbon sequestration: state goals: natural and working lands: registry of projects. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB27*.
[476] SB 859 Public resources: greenhouse gas emissions and biomass (SB 859, Committee on Budget and Fiscal Review, Chapter 368, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB859*.
[477] SB 1386. Resource conservation: working and natural lands. (SB 1386, Chapter 545, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1386*.
[478] CARB. 2017. 2017 Climate Change Scoping Plan Update. Board Resolution 17-46. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2017/res17-46.pdf*.
[479] Executive Department. State of California. EO B-52-18. *https://www.ca.gov/archive/gov39/wp-content/uploads/2018/05/5.10.18-Forest-EO.pdf*.
[480] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. *finalejacrecs.pdf (arb.ca.gov)*.

Trends of Carbon on Landscapes

CARB currently tracks the carbon stock changes though the Inventory of Ecosystem Carbon in California's Lands[481] (NWL Inventory), which is summarized in Chapter 1. The NWL Inventory is a key tool for tracking changes in carbon stocks across the state, and it will serve as the inventory of record for this sector, tracking sector-wide progress toward the target. The NWL Inventory provides a retrospective snapshot of the status of California's lands, and captures the gains or losses of carbon stocks that occur over time. In addition to tracking carbon stock changes, the NWL Inventory is an important tool for understanding the impacts of our efforts to increase climate action in this sector (such as those identified in this Scoping Plan and the NWL Climate Smart Strategy) on NWL carbon stocks. The inventory is also used as the foundation for Scoping Plan scenario modeling and target setting.

CARB's inventory shows that carbon stocks decreased in NWL lands from 2001 to 2011, releasing more carbon than they were storing, and then increased slightly from 2012 to 2014.[482] These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon, and the importance of looking at NWL data and trends over multiyear and multidecadal time periods, as opposed to looking only at annual changes. This movement is part of the Earth's carbon cycle, where carbon transfers between the land, ocean, and atmosphere. As part of the carbon cycle, over decades or centuries, fire and plant respiration and decomposition move carbon from the land to the atmosphere, while plant growth and other processes move carbon from the atmosphere to the land. Emissions from fossil-fuel combustion are contributing to putting this cycle out of balance.

Additionally, some historic land management practices that have resulted in the loss of carbon from the soil are also contributing to the atmospheric rise of CO_2 while simultaneously exacerbating the imbalance of the water cycle, which is influenced by and linked to the carbon cycle. These emissions are also contributing to a feedback loop for California's lands: as CO_2 emissions accumulate in the atmosphere—and California experiences more warming, extreme heat events, and droughts—the risk and intensity of carbon losses also increases, which in turn transfers more carbon from the land to the atmosphere. And because forests and shrublands comprise approximately 85 percent of the carbon stocks in California, management strategies and disturbances in forest and

[481] CARB. *An Inventory of Ecosystem Carbon in California's Natural & Working Lands.* 2018 Edition. *nwl_inventory.pdf (ca.gov).* Accessed 3/2/2022.
[482] These trends are consistent estimates in the most recent AB 1504 reporting period.

shrubland carbon play an important role in determining whether California's lands are providing either net carbon sequestration or net emissions on an annual basis.

The gains and losses of carbon on our lands will fluctuate in the future; what is important is to restore carbon in places where it has been lost and reduce large carbon losses on our NWL through active, attentive, and adaptive management. For additional details on the nexus between NWL and GHGs, see pages 5–6 of the NWL Climate Smart Strategy.

Goals and Accelerating Nature-Based Solutions

The state's climate mitigation targets are traditionally identified by individual years, (i.e., tons of GHG emissions in 2020 or 2030). However, because NWL processes fluctuate year to year and because it can sometimes take decades for climate action to fully impact carbon in NWL, it is important to consider the statewide, long-term trends of carbon stock change when identifying how this sector contributes to California's pathway to achieving carbon neutrality. Tracking carbon stock change over a multi-decadal period is the best way to assess the full direct impact climate action has on carbon storage. Such an approach filters out fluctuations from year-to-year weather variations and multi-year natural climate cycles, such as El Niño patterns.

Current data sources and methods allow us to track only certain carbon stocks that exist on NWL. For target tracking to be successful, each carbon pool must be inventoried using a methodology that can detect changes due to management and climate change. Certain carbon pools lack the scientific data and methodologies necessary for target-setting and tracking. For example, soils in forests, shrublands, and grasslands are not included in the Scoping Plan carbon stock target because, currently, there is no way to track statewide soil carbon through time in a way that would capture the effects of increased climate action and climate change.

When considering how NWL contribute to the state's goal of carbon neutrality, all lands' carbon stock gains and losses must be considered, and the Scoping Plan target is set in these terms. It is not sufficient to aggregate climate benefits only within areas where projects, management, or climate action occur. Much of the state does not receive active or quantifiable management, but these areas still contribute to the state's overall carbon stock change and GHG emissions. To incorporate the entire carbon balance toward true carbon neutrality, the Scoping Plan target is set in terms of carbon stock change across the entire state. This incorporates all lands that both receive and do not receive active management, and includes the end result of all sequestration, emissions, and other changes to carbon on the landscape.

However, carbon stock change is not equivalent to emissions. Currently, the data and emission quantification science is not sufficient to enable inventories to comprehensively track all NWL emissions in a way that would enable us to set an NWL target in terms of

statewide emissions and sequestration. There is a great need, across the entire NWL sector statewide, for more empirical data, science, and tools to track all carbon stocks across each carbon pool, and to begin to track emission and sequestration rates. As California implements AB 1757, there is an opportunity to update the data, science, and tools to enable this level of tracking and target setting in the future.

As outlined in Chapter 2, California is projected to lose carbon stocks over the coming decades, but this Scoping Plan analysis also shows that increasing the pace and scale of climate smart land management in California will reduce the carbon stock losses and GHG emissions from the NWL sector. In response to EO N-82-20 and AB 1757, the proposed target for NWL is shown in Table 4-1.

Table 4-1: Scoping Plan modeled target for NWL, based on increasing action on NWL

	Total Carbon Stock % Change from 2014
2045	-4

Achieving this target will require significant expansion of the pace and scale of climate action on California's NWL, including the following:

- Increasing climate smart forest, shrubland, and grassland management to at least 2.3 million acres a year—an approximate 10x increase in management from current levels.
- Increasing climate smart agricultural practices by at least 78,000 acres adopted a year, annually conserving at least 8,000 acres a year of croplands, and increasing organic agriculture to comprise at least 20 percent of cultivated acres in California by 2045—an approximate 7.5x increase in healthy soils practices from previous levels and a 2x increase in total acres of organic agriculture.
- Increasing annual investment in urban trees in developed lands by at least 200 percent above historic levels and establishing defensible space on all parcels by 2045.
- Restoring at least 60,000 acres, or approximately 15 percent of all Sacramento–San Joaquin River Delta (Delta) wetlands, by 2045.
- Cutting land conversion of deserts and sparsely vegetated landscapes by at least 50 percent annually from current levels, starting in 2025.

If the carbon stock target above is met, and the management actions above are implemented, the modeling for NWL indicates that California's lands will be a net source of emissions, producing approximately 7 $MMTCO_2e$ of average annual emissions.

Additional climate smart management practices and additional landscapes, such as those included in the Climate Smart Strategy and discussed below in Additional Management Strategies, have the potential to increase carbon stocks and reduce GHG emissions from NWL beyond the levels modeled for this Scoping Plan.

The purpose of the NWL target and the above estimated outcomes is to provide a numerical guide that can support the state's efforts to accelerate both near-term and long-term climate action on California's lands, prioritizing durable solutions that deliver multiple outcomes. Taking these actions over the coming decades will reduce the potential carbon losses from NWL, reduce GHG emissions from some landscape types (such as croplands and Delta wetlands), and support sequestration of GHGs from NWL between 2025 and 2045. These actions will also deliver significant benefits to Californians beyond advancing our climate goals, such as reducing wildfire emissions and their associated health impacts, increasing habitat for biodiversity, reducing urban heat island effects, reducing harmful pesticide exposure, expanding economic opportunities, and others. Additional information on several economic and health outcomes from the Scoping Plan Scenario is included in Chapters 2 and 3.

Statewide planning and target setting for the NWL sector will only create meaningful change if followed by effective on-the-ground implementation. State government cannot accomplish this implementation alone. Effective large scale climate action is dependent on partnerships among tribal, federal, state, regional, and local partners, and across governmental, private, nonprofit, and commercial sectors. The NWL sector of the Scoping Plan sets a carbon target with climate action recommendations that can be used to achieve the quantified carbon, health, and economic outcomes. Implementation of these actions must be led by local or regional partnerships that plan and execute projects appropriate to the specific conditions. The technical expertise and local knowledge of land managers and stewards in all sectors must be elevated to ensure relevant, efficient, and effective climate action.

Implementation of climate action should contribute to state targets, maximize local benefits, and alleviate environmental injustices and other social inequities. On-the-ground action is largely executed and managed by local and regional actors, but state government agencies must support communities across the state in implementing nature-based climate solutions that address statewide objectives, such as the Scoping Plan carbon target. This includes providing resources and developing frameworks, while greatly increasing capacity and technical assistance to assist and empower local partners. Examples of how this can be done are the Regional Forest and Fire Capacity Program within the forestry sector, the UC Cooperative Extension in the agricultural and forestry sectors—as well as the work of the state's 10 regional Conservancies. These programs provide strong examples to emulate as they facilitate statewide coordination, and information and resource transfer from the state to the regional and local levels. The Regional Forest and Fire Capacity Program provides funding for local and regional groups

to build their organizational capacity to plan and implement wildfire and forest management projects that are informed by their own local expertise. The UC Cooperative Extension is an example of how the state provides technical assistance to local landowners and community organizations, helping them apply the latest science-based management strategies to their lands. California's regional Conservancies play a pivotal role in implementing regional conservation, restoration, and land management efforts through activities such as grant funding, science generation, and planning assistance.

The state also has identified the need to incorporate and elevate traditional indigenous knowledge into climate action on the regional and local scales. Accomplishing this requires close partnerships with tribes for mutual knowledge and resource sharing, while protecting culturally sensitive knowledge and resources. As Tribes are sovereign nations with specialized cultural knowledge and experience in managing lands, climate action on these lands that contribute to the State of California's climate targets can only be accomplished with the full participation and under the leadership of the Tribes that govern those lands.

Strategies for Achieving Success: Crosscutting Items for all NWL

- Implement AB 1757 and SB 27.
- Implement the Climate Smart Strategy.
- Accelerate the pace and scale of climate smart action, consistent with the management levels identified above, as part of a collective effort between federal, state, private, nonprofit, and individual land managers.
- Prioritize and practice equity, including through meaningful community engagement and prioritizing implementation of nature-based solutions that benefit the communities most vulnerable to climate change.[483]
- Advance multi-benefit, collaborative, landscape-level approaches that engage communities and landowners, and incorporate adaptive managements.
- Consult and partner with California Native American tribes to increase co-management and tribal management authority; restore, protect, and enhance natural cultural resources, traditional foods, and cultural landscapes; respect tribal sovereignty; and support tribes' implementation of tribal expertise and Traditional Ecological Knowledge and cultural easements.[484]

[483] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. *finalejacrecs.pdf (arb.ca.gov).*
[484] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N1, N6, N16, N17, N18. *finalejacrecs.pdf (arb.ca.gov)*.

- Leverage existing innovative financial and market mechanisms, and explore new ones, between the public, private, and philanthropic sectors to secure funding of climate smart land management.
- In partnership with communities, tribes, and the private sector, expand and develop new infrastructure for manufacturing and processing of climate smart agricultural and biomass products.
- Leverage and support technical assistance providers: such as the UC Cooperative Extension and California's 98 Resource Conservation Districts, that have track records of providing technical assistance to local landowners and implementing agriculture, forestry, natural resource management, and restoration projects across the state.
- Establish and expand mechanisms that ensure NWL are protected from land conversion and parcelization (e.g., conservation easements or Williamson Act), in line with the strategies outlined in CNRA's Pathways to 30x30 California.[485,486] Pair land conservation projects with management plans that increase carbon sequestration, where feasible.
- Increase opportunities for private and philanthropic investments in nature-based climate solutions, utilizing existing voluntary and compliance carbon markets, existing state and local programs, and the California Carbon Sequestration and Climate Resiliency Project Registry established pursuant to SB 27.
- Expand monitoring and tracking of management actions and outcomes consistent with the tracking and monitoring recommendations of the Climate Smart Strategy.

Forests, Shrublands, and Chaparral

At roughly 29 million acres, forests cover 27 percent of California. Shrublands and chaparral cover 31 percent of the state; roughly 33 million acres. Both types are distinct, with their own ecological dynamics and management strategies, and are modeled within a single model that is calibrated to treat them uniquely.

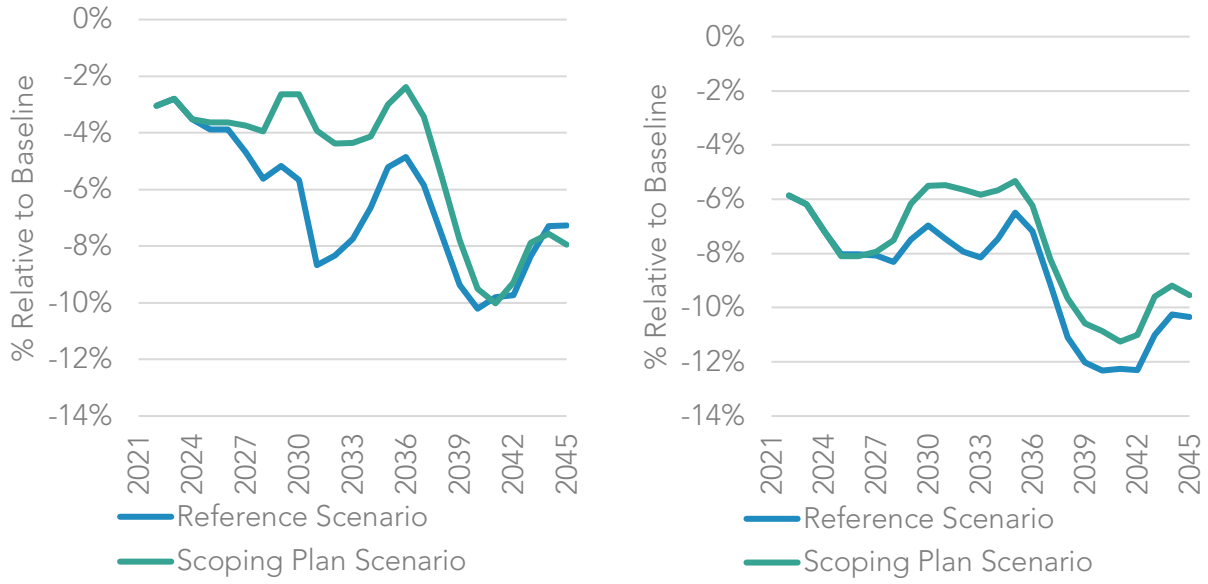
Together, forests, shrublands, and chaparral support a high biodiversity of plants and animals, in addition to high levels of carbon stocks. They provide important air and water quality benefits to all Californians, as well as recreational opportunities and, for forests, harvested wood products for the state. These landscapes are fire-adapted, and historical tribal management of these lands has fostered ecosystem health and resilience. Over the past century, these lands have been impacted severely by fire exclusion, including

[485] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N26, N27. *finalejacrecs.pdf (arb.ca.gov)*.
[486] CNRA. 2022. *Pathways to 30x30 California*. *https://www.californianature.ca.gov/pages/30x30*.

exclusion of indigenous people's management and past management practices, which has resulted in less resilient ecosystems and communities and more destructive wildfires today. This, along with drought induced stress and mortality, has changed these landscapes from a carbon sink to a carbon source. Climate smart management can help make forests more resilient to climate change and less prone to catastrophic wildfire. Climate-smart management in shrublands and chaparral face additional challenges and uncertainty, but can still provide protection for threatened communities and natural resources. This management, if conducted on a regular basis to maintain forest health, can help reduce emissions from forests, shrublands, and chaparral, and help strengthen and maintain the co-benefits that Californians experience from them.

Under all management levels, forests and shrublands are expected to lose carbon over the next two decades due to climate change and wildfire (Figure 4-21).

Figure 4-21: Forest (left) and shrubland (right) carbon stocks by 2045[487,488]



While this decrease in carbon stocks may be inevitable, forest management under the Scoping Plan Scenario can help direct where and how carbon loss occurs. By proactively managing forests and shrublands, the loss of carbon from wildfire can be lessened as the risk of high severity fire is decreased, with the removed biomass going toward a more

[487] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N13. *finalejacrecs.pdf (arb.ca.gov)*.
[488] This analysis is the aggregation of all forests and shrublands from all ownerships across the entire state of California.

useful purpose such as harvested wood products, bioenergy, and engineered carbon removal. Managing for a diverse and resilient forest landscape also can help forests recover more quickly so that when climate change and wildfire impacts occur, forests will be less affected and can continue to thrive and sequester carbon. Additional details on the climate benefit potential of forests and shrublands/chapparal can be found in Section 2 of the NWL Climate Smart Strategy.

Strategies for Achieving Success

- Accelerate the pace and scale of climate smart forest management to at least 2.3 million acres annually by 2025, in line with the climate smart management strategies identified in this Scoping Plan, the NWL Climate Smart Strategy, and the Wildfire and Forest Resilience Action Plan.[489]
- Establish and expand mechanisms that ensure forests, shrublands, and grasslands are protected from land conversion and that support ongoing, rather than one-time, management actions.
- In collaboration with state and local agencies, accelerate the deployment of long-term carbon storage from waste woody biomass residues resulting from climate smart management, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Expand infrastructure to facilitate processing of biomass resulting from climate smart management.
- Expand permit streamlining in collaboration with state and local agencies to accelerate implementation of climate smart forest management while protecting natural resources.

Grasslands

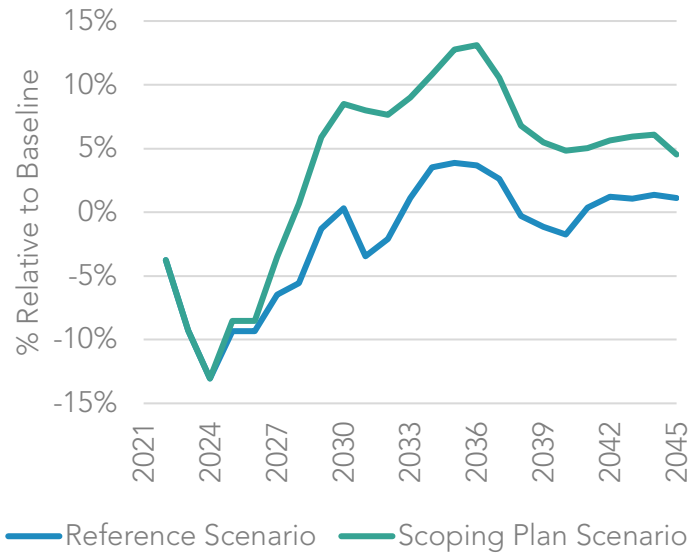
Grasslands cover 9 percent of California, roughly 10 million acres, and are found throughout the state in various landscapes, with concentrations in the foothills surrounding the Sacramento and San Joaquin Valleys. In addition to carbon storage (primarily in the soil), grasslands provide open space, wild habitat, grazing land, and important water filtration and recharge benefits. The protection of grasslands provides an opportunity to reduce sprawl and complement VMT reduction strategies. As grasslands are susceptible to invasive species, climate smart strategies can increase grassland

[489] Forest Management Task Force. 2021. *California's Wildfire and Forest Resilience Action Plan: Recommendations of the Governor's Forest Management Task Force.* https://www.fire.ca.gov/media/ps4p2vck/californiawildfireandforestresilienceactionplan.pdf.

resilience to climate change by improving species diversity and maintaining or increasing soil carbon stocks.

Modeling results show that increased fuels treatments and avoided land conversion can increase carbon stocks on grasslands by 2045, but sequestration rates fluctuate annually. Grasslands are capable of high carbon sequestration rates but are susceptible to carbon losses from wildfire and land conversion. Soil carbon is the major carbon pool on these lands, and continued future improvement of the monitoring and modeling of soil carbon is needed. Similar to forests and shrubland/chaparral, modeling alternatives that include fuels treatments resulted in greater carbon stocks compared to no management, and had lower wildfire emissions. Unlike forests and shrubland/chaparral, which have a general declining carbon stocks trend, the modeling results (Figure 4-22) show grasslands can maintain or increase carbon stocks with active management. Details on the climate benefit potential of grasslands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-22: Grassland carbon stocks by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure grasslands are protected from land conversion/parcelization and that support ongoing, rather than one-time, management actions that improve carbon sequestration.
- Deploy grassland management strategies, like prescribed grazing, compost application, and other regenerative practices, to support soil carbon sequestration, biodiversity, and other ecological improvements.

- Increase adoption of compost production on farms and application of compost in appropriate grassland settings for improved vegetation and carbon storage, and to deliver waste diversion goals through nature-based solutions.

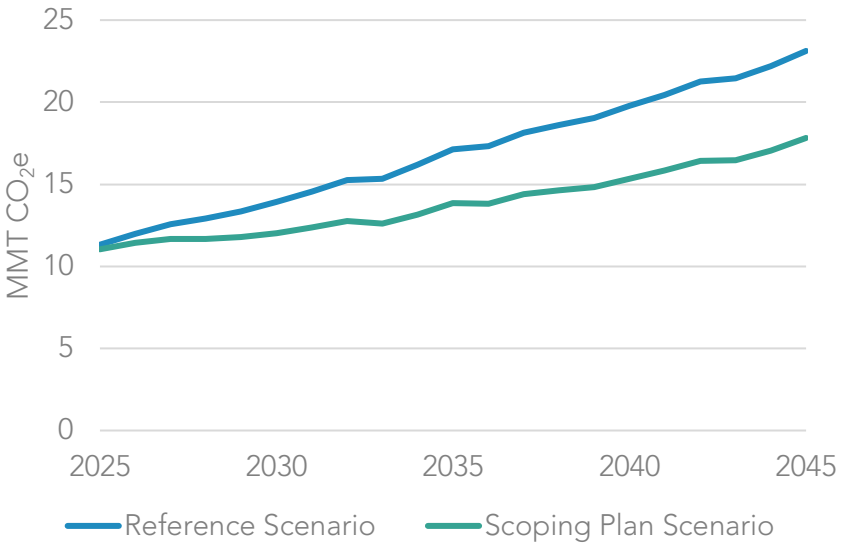
Croplands

Croplands cover 9 percent of the state, roughly 9.5 million acres. This land is some of the most productive agricultural land in the world, and enables California to be a global leader in agriculture. Aside from developed lands, croplands are the most intensively managed landscapes in the state, and are closely tied to society through the food they produce and the constant, direct contact that people have with croplands through the course of management. In addition to food security, croplands provide considerable carbon storage in the soil and, in perennial croplands, in aboveground biomass. Climate smart practices can improve public health; for example, by reducing synthetic fertilizer and pesticide use. They also help to maintain or increase the climate resilience of cropland productivity through improved soil conditions and increased pollinator habitat.

There is also significant potential to transform this sector to increase soil carbon storage, reduce GHG emissions (Figure 4-23), and reduce pesticide exposure and health impacts. Moving to an agricultural system that improves soil health and water holding capacity reduces over-application of nitrogen, reduces the use of pesticides and fumigants, and increases biodiversity and pollinator habitat, supporting California's pathway to carbon neutrality while simultaneously improving the lives of those who live and work in the agricultural community. Croplands are intricately tied to people, communities, and their health, and through climate smart practices and cropland conservation, these lands have the potential to contribute more to society than just food.[490] The implementation of climate smart agricultural practices and diversified organic agriculture can help California achieve social and environmental benefits, like improving water use efficiency, increasing pollinator habitat, and reducing synthetic fertilizer and pesticide use.[491] Additional details on the climate benefit potential of croplands can be found in Section 2 of the NWL Climate Smart Strategy.

[490] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations In-part (N3, N4, N22), N5, N21. *finalejacrecs.pdf (arb.ca.gov)*.
[491] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 4-23: Cumulative CO_2e emissions from annual croplands in 2045[492]



CARB recognizes the complex nature of croplands, cross-sector relationships, and the need to build on this analysis to further our understanding of cropland dynamics. Many more aspects of cropland management need to be explored for potential climate benefits, such as water and nutrient use management, pest control methods, crop rotations, and other management practices. The impacts of climate change on water availability, annual/perennial crop growth, and future carbon sequestration trends are uncertain, and recent policies such as the Sustainable Groundwater Management Act may also influence cropland management in unforeseen ways. Nonetheless, it is clear that greater climate smart practice implementation can prepare California for the future and yield tangible benefits for the state.

Strategies for Achieving Success

- Accelerate the pace and scale of healthy soils practices to 80,000 acres annually by 2025, conserve at least 8,000 acres of annual crops annually, and increase organic agriculture to 20 percent of all cultivated acres by 2045.

[492] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

- Utilize the recommendations included in CDFA's Farmer and Rancher-Led Climate Change Solutions[493] report to accelerate deployment of healthy soils practices, organic farming, and climate smart agriculture practices.
- Establish or expand financial mechanisms that support ongoing deployment of healthy soils practices and organic agriculture.[494]
- Support strategies that achieve co-benefits of safer, more sustainable pest management practices and the health and preservation of ecosystems, such as implementing the California Department of Pesticide Regulation's (DPR's) Sustainable Pest Management Work Group recommendations.[495]
- Conduct research on the intersection of pesticides, soil health, GHGs, and pest resiliency via a multi-agency effort with DPR, CDFA, and CARB.[496]
- Conduct outreach and education to develop and facilitate the increased adoption of safer, more sustainable pest management practices and tools; reduce the use of harmful pesticides; promote healthy soils; improve water and air quality; and reduce public health impacts.
- In collaboration with state and local agencies, accelerate the deployment of alternatives to agricultural burning that increase long-term carbon storage from waste agricultural biomass, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Work across state agencies to reduce regulatory and permitting barriers around some healthy soils practices (e.g., composting), where appropriate.
- Utilize innovative agriculture energy use and carbon monitoring and planning tools to reduce on-farm GHG emissions from energy and fertilizer application or to increase carbon storage, as well as to promote on-farm energy production opportunities.

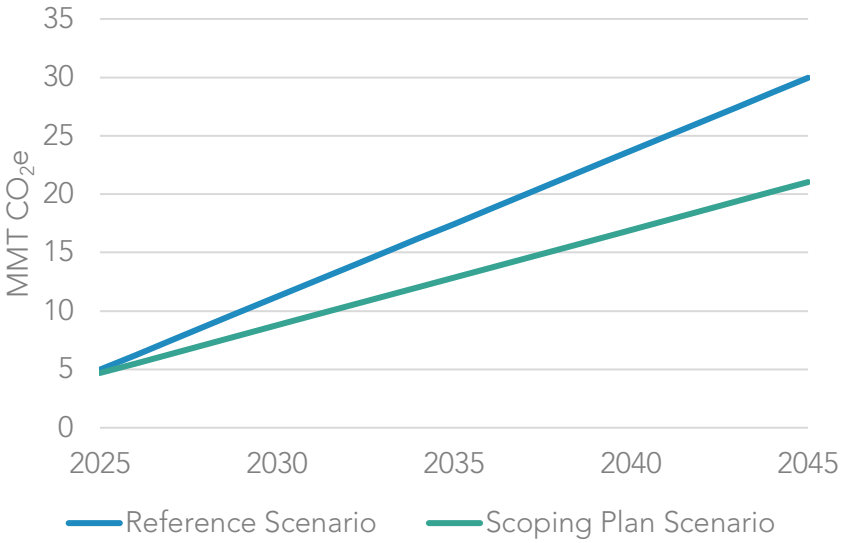
[493] California Department of Food and Agriculture. 2021. Farmer and Rancher Led Climate Change Solutions. *https://www.cdfa.ca.gov/oefi/climate/docs/cdfa_farmer_and_rancher-led_climate_solutions_meetings_summary.pdf*.
[494] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N7. *finalejacrecs.pdf (arb.ca.gov).*
[495] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations N3, N4, N5, N7, N22. *finalejacrecs.pdf (arb.ca.gov)*.
[496] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Wetlands

Wetlands cover 2 percent of the state (roughly 1.7 million acres) and include inland and coastal wetlands, such as vernal pools, peatlands, mountain meadows, salt marshes, and mudflats. These lands are essential to California's communities as they serve as hotspots for biodiversity, contain considerable carbon in the soil, are critical to the state's water supply, and protect upland areas from flooding due to sea level rise and storms. Wetlands have been severely degraded through reclamation, diking, draining, and dredging practices in the past, resulting in the emissions of the carbon stored in the soils and the loss of ecosystem benefits. Climate smart strategies to restore and protect all the types of wetlands can reduce emissions while simultaneously improving the climate resilience of surrounding areas and improving the water quality and yield for the state. Restored wetlands also can reduce pressure on California's aging water infrastructure. These benefits beyond emissions reductions will help in the future, as climate change is predicted to negatively affect water supply.

Avoided conversion and restoration of Delta wetlands reduces CO_2 and methane emissions from wetlands, with GHG reductions scaling with implementation rates (Figure 4-24). Expansion of conservation and restoration efforts will generate benefits such as the conservation of biodiversity, improved water quality and supply, and reduced flood risk. Additional details on the climate benefit potential of wetlands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-24: Cumulative CO_2e emissions from Delta wetlands by 2045



Strategies for Achieving Success

- Restore 60,000 acres of Delta wetlands annually by 2045 to reduce methane emissions from wetlands and reverse the resulting subsidence.

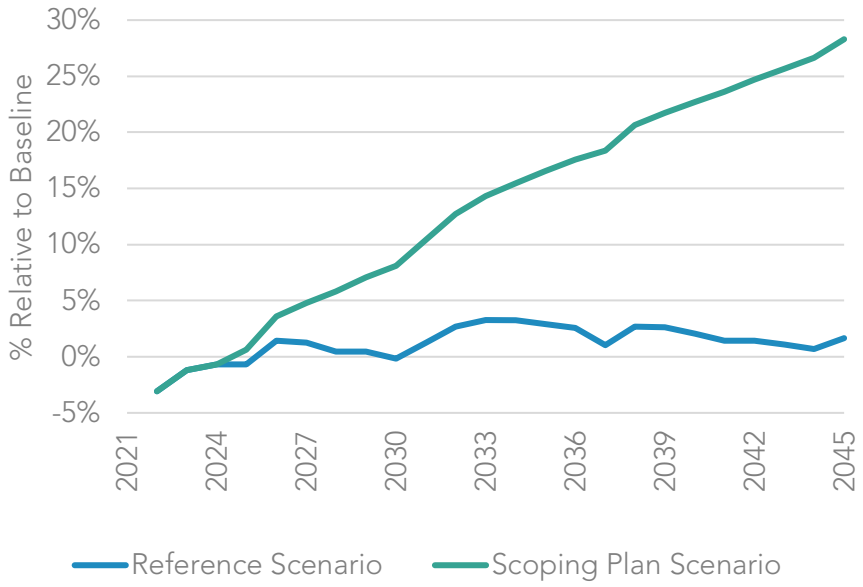
- Identify and prioritize wetland restoration efforts around climate vulnerable communities.
- Leverage other funding and institutions to support wetland restoration projects, including land trusts, local funding (e.g., San Francisco Measure AA), federal funding, and private and philanthropic funding to support wetlands restoration projects.
- Work across state agencies to reduce regulatory and permitting barriers around wetland restoration projects, where appropriate.

Developed Lands

Developed lands cover 6 percent of the state (roughly 6.8 million acres) and include urban, suburban, and rural areas, as well as transportation and supporting infrastructure throughout California. This area encapsulates the land on which the vast majority of Californians reside and call home. The vegetation within cities and communities, and along infrastructure, are all part of developed lands. This vegetation provides numerous benefits to surrounding areas, including carbon storage, air and water filtration, reduced urban heat island effect, and access to nature, aesthetics, and mental health, among others. These areas are susceptible to climate change as well, and climate smart strategies to protect and expand the urban forests, landscaping, green spaces, parks, and associated vegetation can increase their climate resilience and the benefits Californians derive from them. These strategies also have a significant opportunity to benefit disadvantaged communities, who may not have equitable access to these practices or the benefits they provide. Additional details on the climate and equity benefit potential of developed lands can be found in Section 2 and the Introduction of the NWL Climate Smart Strategy.

Urban forests have a significant potential to sequester carbon (Figure 4-25). They are vastly different from wildland forests, as they require investments to maintain and irrigate. This results in the need for a significant increase in investment to increase urban forest carbon. As urban forests become denser and management difficulty increases, the carbon stock returns on investment diminish, making it expensive to maximize carbon in urban forests. Water availability and irrigation efficiency are also an important consideration for increasing urban forest cover. As water becomes scarcer, the prioritization of irrigating trees over lawns or gardens may be required to achieve increases in urban forest carbon.

Figure 4-25: Carbon stocks in urban forests by 2045



Within wildland-urban interface (WUI) areas, defensible space can protect urban and rural communities from wildfire. Analysis results show that 48 percent of parcels are currently fully compliant with defensible space requirements. This highlights how much work needs to be done to protect communities and homes. Defensible space results in a decrease in carbon stocks, as expected when reducing fuels for wildfire.

Strategies for Achieving Success

- Increase urban forestry investment annually by 200 percent, relative to business as usual.
- Increase public awareness of urban forest benefits and, where appropriate, prioritizing irrigation of trees over lawns.
- Provide technical assistance and resources to disadvantaged communities to implement community urban greening projects to provide equitable access to the benefits of urban greening projects.[497]
- Work with state and local agencies to expand technical assistance for and enforcement of the defensible space requirements of PRC 4291 to reduce wildfire risk to homes and structures.

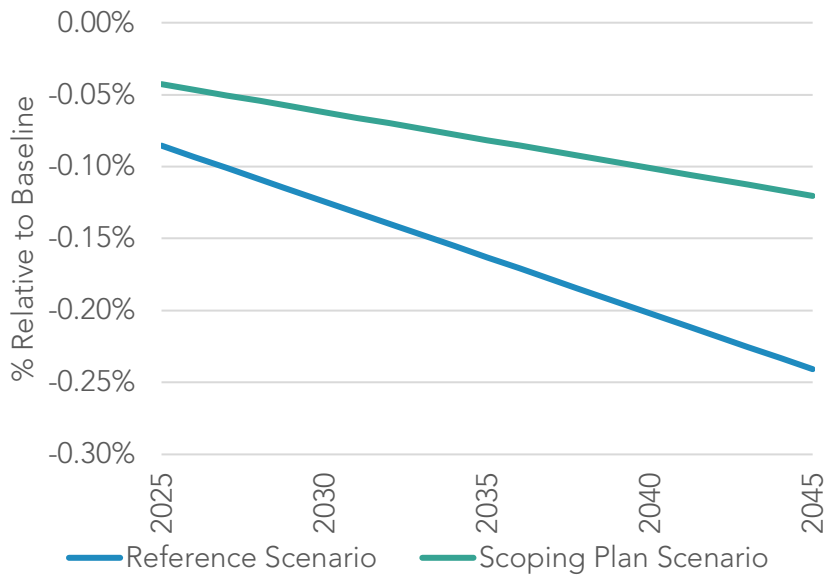
[497] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. *finalejacrecs.pdf (arb.ca.gov)*.

Sparsely Vegetated Lands

Sparsely vegetated lands cover 10 percent of the state, roughly 10.2 million acres, primarily in the east and southern parts of California. These lands include deserts, beaches, dunes, bare rock, and areas covered in ice and snow (e.g., higher mountain elevations). The limited carbon storage of these lands varies from bare rock and mineral soil to more vegetated areas, though severe climate limits the amount of biomass. Nonetheless, sparsely vegetated lands are important for open space and provide rare and unique habitats for endemic species and a diversity of wildlife. These lands present important recreational opportunities for Californians and serve as important protective buffers in coastal and low-lying areas. Land use change threatens these lands, and conservation efforts are important for protecting these unique areas of California.[498]

Avoided conversion of sparsely vegetated lands reduces the organic carbon lost from the soil, which is the major carbon pool in this land type (Figure 4-26). In identifying the outcomes for sparsely vegetated lands, CARB modeled avoided land conversion to another land use.

Figure 4-26: Carbon stocks in sparsely vegetated lands by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure sparsely vegetated lands are

[498] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26. finalejacrecs.pdf (arb.ca.gov).

protected from land conversion, prioritizing those areas most vulnerable to climate change and loss.

Additional Management Strategies

Additional nature-based climate solutions beyond those management strategies modeled for this Scoping Plan are available for implementation, but either cannot currently be modeled and/or affect carbon and the landscape in ways that cannot currently be tracked. Nevertheless, it is important to take action even where these technical gaps exist. Some of these actions, such as cultural burning and indigenous farming practices, have been used on large scales for decades or even centuries, while others are relatively new concepts. The state nevertheless recommends implementing the additional solutions listed here to achieve potential additional climate benefits, as well as other co-benefits. These additional solutions were drawn from the NWL Climate Smart Strategy and stakeholder, tribal government, and interagency feedback.[499]

Considerations

Although these practices are recommended, because of the lack of in-depth modeling and analysis available, several considerations must be addressed when implementing them. These considerations also apply to the management strategies included in the Scoping Plan Scenario.

- Future climate change impacts are uncertain: The negative impact that climate change can have on the ability of these practices to maintain expected climate benefits is uncertain and may significantly change in the future. Climate change is expected to further diminish the already constricting growing conditions in California, with increasing droughts, more extreme weather events, and expanding disturbances from fire, insects, and disease. It is estimated that suitable habitat for many native plant and animal species could shift, creating novel ecosystems without historical precedent. Close monitoring of all practices, including no management, across our NWL will be critical to understand if and how future climate change affects outcomes and how to adapt management to meet the needs of the system under climate change.[500]

[499] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N24. *finalejacrecs.pdf (arb.ca.gov)*.
[500] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N15. *finalejacrecs.pdf (arb.ca.gov)*.

- Local conditions: Not every practice is applicable, feasible, or even desirable in every location across California. Implementation of these practices should account for local conditions and needs that may affect the appropriateness of that practice.
- Long-term carbon storage: The ability to sequester additional carbon into NWL is only beneficial to the climate if that carbon stays out of the atmosphere. Many of the additional practices listed here may require continual incentives or interventions to ensure permanence of carbon storage in the soil and biomass. For example, in croplands, it is difficult to estimate how much of the carbon stored by no-tillage can be released by a single subsequent tillage, but a return to conventional tillage would usually be expected to erase most gains.[501,502]
- Scaling actions: There are uncertainties on how these practices may impact both the environment and communities when significantly expanded. For this reason, it is best to take a cautious and measured approach to ramping up actions to a larger scale.
- Infrastructure and operational needs: Scaling up the implementation of some of these practices demands transformational change in the supporting infrastructure and operational frameworks. For example, increasing forest management to the degree included in the Scoping Plan Scenario will require significant changes to wood-processing infrastructure, workforce capacity, permitting processes, technical assistance, and other operational constraints. The increased application of compost to croplands, and potentially to rangelands, will require a significant increase in organic waste and dairy manure collection to increase compost supply, in line with SB 1383. This will also require additional compost production facilities as well as compost/organic waste transportation and application methods.
- Co-benefits: Many co-benefits from these practices exist beyond the climate benefits. These co-benefits include improved public and worker health; improved microbial, insect, and wildlife habitat; enhanced biodiversity; greater labor demand in the nature-based economy; and improved climate resilience.
- Labor and Economics: Many of these practices require additional labor, and an evaluation of how many more jobs are needed to carry out many of these practices

[501] Muñoz-Romero, V., R. J. Lopez-Bellido, P. Fernandez-Garcia, R. Redondo, S. Murillo, and L. Lopez-Bellido. 2017. “Effects of tillage, crop rotation and N application rate on labile and recalcitrant soil carbon in a Mediterranean Vertisol.” *Soil Tillage Res.* 169, 118–123.
[502] Mitchell, J. P., A. Shrestha, W. R. Horwath, R. J. Southard, N. Madden, J. Veenstra, and D. S. Munk. 2015. “Tillage and cover cropping affect crop yields and soil carbon in the San Joaquin Valley.” *California. Agron. J.* 107, 588–596.

is currently unknown. There will also be the need to explore the costs and economic benefits of implementing these additional practices.

- Retreatments: All of these practices have limits on how long they can enhance carbon sequestration. Many of these practices need to be periodically repeated, followed by complementary practices, or maintained through time. This increases costs and requires diligence and long-term stewardship.

Additional NWL Actions and Strategies

Below is a set of additional actions that should be taken on California's natural and working lands. Again, these practices were not modeled for this Scoping Plan, and all of the considerations listed above should be taken into account before implementing the following actions.

- Conservation of all NWL types (in line with the NWL Climate Smart Strategy and CNRA's Pathways to 30x30 California) is critical to ensuring continued carbon sequestration and provision of co-benefits from these lands for all Californians.[503]
- Reforestation following disturbance, using appropriate species, is an impactful practice that can help prevent conversion away from forestland and establish new trees to sequester carbon. The number of acres that may need reforestation following high severity wildfires is estimated to continue to increase into the future.
- Restoration of shrublands, chaparral, riparian zones, and oak woodlands across California includes a variety of practices to alter their structure and return endemic species to the areas. These unique habitats provide multiple co-benefits to the state, such as clean water, reduced wildfire risk, and biodiverse habitats for flora and fauna.
- Conservation and restoration of wetlands, beyond the Delta wetlands included in the NWL modeling, can protect these unique habitats and the climate benefits they provide. These wetland types can include but are not limited to coastal wetlands, mountain meadows, vernal pool complexes, alkali sinks and meadows, and floodplains.
- Conservation and restoration of seagrasses and seaweeds provide a number of benefits, including carbon storage and sequestration, habitat provision for many culturally and commercially important species of fishes and invertebrates, shoreline protection, and tourism opportunities.[504]

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[503] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26, N27. *finalejacrecs.pdf (arb.ca.gov)*.
[504] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. *finalejacrecs.pdf (arb.ca.gov)*.

- Prescribed herbivory utilizes various livestock to consume vegetation to reduce fuel loads across an area. This fuel management practice can be used in forests, grasslands, and shrublands as an effective alternative to herbicide use, and should be considered wherever local conditions allow.
- Urban and community greening efforts such as green schoolyards, urban farms, rain gardens, community gardens, community composting, and many more provide numerous health benefits to communities.
- Additional Healthy Soils Program practices on annual croplands such as conservation cover and crop rotation, biomass planting for borders, wind barriers, riparian areas, and improved nutrient management can improve soil health, water retention, and increase carbon stocks.
- Healthy Soils Program practices on perennial croplands and rangelands, such as compost application and alley cropping/cover cropping to improve soil health, water retention, erosion control, and biomass growth.[505]
- Stacking of these Healthy Soils Program practices, where appropriate, in perennial and annual systems, can synergistically improve soil health and provide multiple benefits.
- Mulching adds high carbon materials to croplands or fallowed lands to reduce competing vegetation and retain moisture. This practice can support other benefits such as reduced water use and reduced synthetic pesticide and fertilizer use, as well as provide a use for suitable forest and agricultural waste biomass.
- Reductions in the use of synthetic fertilizers in cropland management, generally supported by the implementation of new management tools or technologies, can lead to reductions in GHG emissions from the production and application of fertilizers. This benefit is in addition to the co-benefits of reduced chemical runoff into waterways and reduced exposure of human populations to their harmful effects.

[505] Various types of organic amendments are being researched for application to particular landscape types. For example, compost application to rangelands is a relatively new practice that has been shown to improve soil health and increase carbon sequestration in the short term, though the science on the long-term impacts of this practice is still developing and the supply of available compost may be limiting.

Chapter 5: Challenge Accepted

This chapter provides an overview of the next steps and partnerships that will be needed to successfully implement this Scoping Plan. The path forward is not dependent on one agency, one state, or even one country. It will take action on a global level to address the threat climate change poses. But, the work begins at home.[506] The state can lead by engaging Californians and demonstrating how action at the state, regional, and local levels of government, as well as action at community and individual levels, can contribute to addressing the challenge before us. We must build partnerships with academic institutions, private industry, and others to support and accelerate the transition to carbon neutrality. Ultimately, the success of this Scoping Plan will be measured by our ability to implement the actions modeled in the Scoping Plan Scenario at all levels of government and society. This will depend on a mix of legislative action, regulatory program development, incentives, institutional support, workforce and business development, education and outreach, community engagement, and research and development and deployment. Optimizing this mix will help to ensure that clean energy and other climate mitigation strategies are clear, winning alternatives in the marketplace and in communities—to promote equity, drive innovation, and encourage consumer adoption. Bold institutional action will catalyze continued research and push private investment to create jobs and bring innovative ideas to reality.

State-level Action

Achieving the targets described in this Scoping Plan will require continued commitment to and successful implementation of existing policies and programs and identification of new policy tools and technical solutions to go further, faster. California's Legislature and state agencies will continue to collaborate to achieve the state's climate, clean air, equity, and broader economic and environmental protection goals. It will be necessary to maintain and strengthen this collaborative effort, and to draw upon the assistance of the federal government, regional and local governments, tribes, communities, academic institutions, and the private sector to achieve the state's near-term and longer-term emission reduction goals and a more equitable future for all Californians.

[506] This "polycentric" approach to climate challenges, engaging many levels of government, was articulated in leading papers by Nobel laureate Elinor Ostrom. See, for example, Ostrom, E. 2014. "A Polycentric Approach to Coping with Climate Change." *Annals of Economics and Finance* 15-1, 97–134.

Regulations and Programmatic Development

Meeting the AB 32 2020 GHG emissions reduction target several years earlier than mandated demonstrated that developing mitigation strategies through a public process, where all stakeholders have a voice, leads to effective actions that address climate change and yields a series of additional economic and environmental co-benefits to the state. Following adoption of this Scoping Plan, state agencies will continue to update and implement new and existing programs to align with the outcomes in the plan. Community, tribal, and stakeholder engagement will be a critical part of this work. Several state agencies, including CARB, the CEC, the California State Transportation Agency (CalSTA), the CPUC, and others will need to be part of various subsequent rulemaking processes. Each of these agencies' leadership and technical staff will engage with the public through public meetings, written and oral comment, and other methods of engagement. This work will be informed by evaluations of the health, air quality, environmental, equity, and economic benefits and impacts of regulations, including an assessment of the societal cost of carbon, as required under AB 197.

Incentive Programs

As described in Chapter 1, incentive programs are one of the most important tools the state has in advancing our low carbon future, especially for climate vulnerable communities. The programs ensure clean technology and energy are accessible and are critical to closing ongoing opportunity gaps. These programs also leverage private-sector investment and build sustainable, growing markets for clean and efficient technologies, and they are particularly necessary to support GHG emission reduction strategies for priority sectors, sources, and technologies. Clean technologies are often already the best and lowest cost option over their lifetimes but incentive funding is critical to ensure that they are broadly available, especially in climate vulnerable communities. Incentives also build on California's long track record of driving innovative technology developments, and creating new industries, with targeted investment. The Inflation Reduction Act also provides a new source of funding and tax incentives that must be leveraged to help achieve the state's climate goals.

Many state funding programs are designed to achieve multiple objectives simultaneously: reduce emissions from GHGs, criteria pollutants, and toxic air contaminants; manage natural and working lands for carbon sequestration; and address health and opportunity gaps in disadvantaged communities. California's incentive programs focused on jump-starting the transition to a zero emission transportation future are a good example of this "stacked" approach. The state is investing billions of dollars through programs such as the On-Road Heavy-Duty Voucher Incentive Program and Clean Cars 4 All in order to replace the light- and heavy-duty vehicles most responsible for the state's GHG emissions and poor air quality, all while bolstering the nascent ZEV market. Further strategies aid in developing new technologies, in ramping up access for all, and in shifting to cleaner

modes of transport; for instance, by supporting investments in walkable, bikeable communities and transit, as well as in vehicles. This funding strategy is, of course, paired with the regulatory approach described above.

Local Action

Local action by cities can support and amplify efforts to reduce GHGs. For example, the City of Oakland requires all new construction to be all-electric and is currently working on electrifying existing buildings.[507] In addition, starting in 2023, the City of Sacramento will require all new buildings under three stories to be all-electric, and it extends the mandate to all new construction by 2026 with some limited exemptions. The City of Sacramento also requires levels of EV charging infrastructure in new construction starting in 2023, higher than the minimum state requirements, and provides parking incentives for zero-emission carsharing and EV charging.[508] Local governments asserting this type of leadership are critical partners in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment.

California must accommodate population and economic growth in a far more sustainable and equitable manner than in the past. Good climate policy can and should create affordable and pleasant places to live, with effective transport and clean air for all—a future in which local governments and communities are central partners. Local governments have the primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth, economic growth, and the changing needs of their jurisdictions. They also make critical decisions on how and when to deploy transportation infrastructure, and can choose to support transit, walking, bicycling, and neighborhoods that do not force people into cars. Local governments also have the option to adopt building ordinances that exceed statewide building code requirements, and play a critical role in facilitating the rollout of ZEV infrastructure. As a result, local government decisions play a critical role in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment—the two largest GHG emissions sectors over which local governments have authority.

Local governments are also frequently the source of innovative and practical climate solutions that can be replicated in other areas. Their efforts to reduce GHG emissions within their jurisdictions are vital to achieving the state's near-term air quality and long-term climate goals. Local governments must continue to take action that affirmatively

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[507] City of Oakland. Building Electrification. *https://www.oaklandca.gov/projects/building-electrification*.

[508] City of Sacramento. Electrification of New Construction. *http://www.cityofsacramento.org/SacElectrificationOrdinance*.

builds the projects and expend the funds needed to further the state's collective path toward equitable emissions reductions. As such, aligning local jurisdiction action with state-level priorities to tackle climate change and the outcomes called for in this Scoping Plan is critical to achieving the statutory targets for 2030 and 2045. Local governments can implement climate strategies that can effectively engage residents by addressing local conditions and issues that also deliver local economic benefits.

Local Climate Action Planning and Permitting

California encourages local jurisdictions to take ambitious, coordinated climate action at the community scale; action that is consistent with and supportive of the state's climate goals.[509] As discussed in more detail in Appendix D (Local Actions), local jurisdictions can do much to enable statewide priorities, such as taking local action to help the state develop the housing, transport systems, and other tools we all need. Indeed, state tools—such as the Cap-and-Trade Program or zero-emission vehicle programs—do not substitute for these local efforts. Multiple legal tools are open to local jurisdictions to support this approach, including development of a climate action plan (CAP), sustainability plan, or inclusion of a plan for reduction of GHG emissions and climate actions within a jurisdiction's general plan. Any of these can help to align zoning, permitting, and other local tools with climate action.

Once adopted, the GHG emissions reductions plans detailed in CAPs can provide local governments with a valuable tool for coordinated climate planning in their community. When a local CAP complies with CEQA requirements, individual projects that comply with the CAP are allowed to streamline the project-specific GHG analysis.[510,511] Effectively, local governments that adopt a CEQA-compliant CAP enable project developers to use this streamlined approach. This saves time and resources and provides more consistent expectations for how GHG reduction measures are applied across projects in the jurisdiction. While the state encourages local governments to follow this approach, we acknowledge not all jurisdictions have the resources to develop a CAP that meets the CEQA requirements.

In addition to being required for a local CAP to comply with CEQA, local GHG reduction targets have long been recommended as part of the process of developing a climate

[509] This plan provides more detailed guidance and tools to local governments in Appendix D (Local Actions).

[510] Cal. Code of Regs., tit. 14, § 15183.5.

[511] California Governor's Office of Planning and Research. n.d. "General Plan Guidelines - Chapter 8 Climate Change."

action plan.[512] One challenge local jurisdictions have faced is how to evaluate and adopt quantitative, locally appropriate goals that align with statewide goals. An effective response to this challenge is to focus on goals that can help implement overall state priorities—enabling the key transformations California needs.

There are many ways that local governments can make key contributions to this transformation, depending on the characteristics of their jurisdiction and community. For example, some jurisdictions will inherently have more land capacity to remove and store carbon, whether through natural and working lands or by other means. Other jurisdictions will be host to GHG-emitting facilities that serve necessary functions and will take time to transition to clean technology (e.g., municipal wastewater treatment plants, landfills, and energy generation and transmission facilities). It is important to recognize that we will need to build new energy production and distribution infrastructure, and repurpose existing ones, for clean technology and energy before we are able to phase down existing fossil sources. There also will be a need to handle the significant amount of biomass resulting from sustainable forest management for catastrophic wildfire prevention, agricultural waste, and landfill diversion.

Regional efforts can support change too: energy and transportation systems that serve Californians do not stop at jurisdictional boundaries, and some local decisions can have ramifications for other communities. For instance, Metropolitan Planning Organizations (MPOs) can help to integrate local efforts by planning consistent with the Scoping Plan and Climate Action Plan for Transportation Infrastructure, including by removing polluting roadway capacity expansions from project pipelines and instead focusing on climate-friendly solutions. These varied capabilities and needs should be taken into account in setting targets for local climate plans. For instance, although net zero targets can often be valuable and achievable, and mitigation is important, targets should be considered in the larger context of these goals. This all means any GHG targets on a local scale should take into consideration the actions and outcomes included in this Scoping Plan. Jurisdictions considering “net zero” targets should carefully consider the implications such targets may have on emissions in neighboring communities and the ability of the state to meet our collective targets.

Jurisdictions without formal CAPs also have important opportunities within this context. These jurisdictions can still take actions that effectively translate key state plans, goals, and targets, including those articulated in this Scoping Plan for local action. For instance, state ZEV targets can advance local efforts to promote broad and equitable access to charging and fueling. Similarly, local jurisdictions can enable reduced dependence on

[512] Climate Smart Communities. 2014. Climate Action Planning Guide. https://cdrpc.org/wp-content/uploads/2015/05/CAP-Guide_MAR-2014_FINAL.pdf.

single-occupancy vehicles by supporting dense infill housing and transit, among other actions. Such actions can be reflected in particular project plans, in general plans, or through other local policies. Regional partnerships among these jurisdictions can also help tap resources and provide for more effective overall action.

Unlocking CEQA Mitigation for Local Success

The California Environmental Quality Act also provides important tools for lead agencies to support the achievement of the state's GHG and VMT reduction goals. Although many climate-friendly local government actions already fall into categories that may not require a full CEQA analysis, thanks to streamlining or other tools, and although certain product types (such as affordable infill housing) are generally clearly consistent with state climate goals, CEQA analyses may still sometimes be required. CEQA can be a powerful and useful tool to engage the public, identify additional opportunities to support climate efforts, and localize change. It is important that lead agencies look for ways to use CEQA to support these core purposes, ensuring that these processes do not become sources of delay but instead unlock more opportunities. The uncertainty analysis in Chapter 2 evaluates how project implementation delays can lead to missed state climate targets and continued dependence on fossil energy. Mitigation measures applied in the communities affected by projects subject to CEQA have the added benefit of improving health, social, and economic resiliency as climate impacts worsen.

Appendix D (Local Actions) explores the role of local government action and CEQA in detail. As discussed there, an important CEQA-related tool is mitigation—which can be used to further drive local action consistent with state climate goals. When a lead agency determines that a proposed project would result in potentially significant GHG impacts due to its GHG emissions or a conflict with state climate goals, the lead agency must impose feasible mitigation measures to minimize the impact. Appendix D (Local Actions) provides suggestions for prioritizing the various types of mitigation, starting with on-site GHG-reducing design features[513] and mitigation measures, such as methods to reduce VMT and support building decarbonization, access to shared mobility services or transit, and EV charging. After exhausting all the on-site GHG mitigation measures, CARB recommends prioritizing local, off-site GHG mitigation measures, including both direct investment and voluntary GHG reduction or sequestration projects, in the neighborhoods impacted by the project. This could include, for example, development of a neighborhood green space, investment in street trees, or expansion of transit services. Implementing GHG mitigation measures in the project's vicinity would allow the project proponent and the lead agency to work directly with the affected community to identify and prioritize the

[513] Cal. Code of Regs., tit. 14, § 15126.4(c)(2) and (3).

mitigation measures that meet their needs while minimizing multiple environmental and societal impacts.

Once all potential on-site and local off-site GHG mitigation measures have been incorporated to the extent feasible, Appendix D (Local Actions) provides further suggestions for prioritizing other mitigation types, including non-local off-site mitigation, and voluntary offsets issued by a recognized and reputable voluntary carbon registry (as listed on CARB's website[514]) may be appropriate. Additional in-state mitigation also may be available in the upcoming SB 27[515] (Skinner, Chapter 237, Statues of 2021) registry, which will serve as a database of projects in the state that drive climate action on natural and working lands. Lead agencies should use substantial evidence to demonstrate that the project proponent explored and prioritized investments in feasible, local mitigation prior to moving mitigation to a geography located farther away from the project.

Communities and Environmental Justice

As noted in Board Resolution 20-33,[516] it is incumbent on CARB to function as an agent of responsible social change, especially when it is clear that environmental injustices continue to persist for low-income communities, tribes, and communities of color.

State law defines *environmental justice* as the fair treatment of all people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.[517] Government Alliance for Race and Equity (GARE)[518] defines *racial equity* as when race can no longer be used to predict life outcomes and outcomes for all groups are improved.

For this Scoping Plan to be successful, it must address environmental justice and advance racial equity. Implementation of the plan needs to address the needs of those communities that are disproportionately burdened by climate impacts and continue to face significant health and opportunity gaps. Now, we need to ensure our actions allow these communities to not only have a seat at the table, but also inform and shape the policies

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[514] CARB. 2022. Offset Project Registries. *https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-registries*.

[515] SB 27. Carbon sequestration: state goals: natural and working lands: registry of projects. (SB 27, Skinner, Chapter 237, Statutes of 2021). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB27*.

[516] CARB. 2020. Resolution 20-33: A Commitment to Racial Equity and Social Justice. October 22. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2020/res20-33.pdf*.

[517] Gov. Code, § 65040.12, subd. (e).

[518] Local and Regional Government Alliance on Race and Equity. 2015. *Advancing Racial Equity and Transforming Government: A Resource Guide to Put Ideas into Action.* Page 9. *https://racialequityalliance.org/wp-content/uploads/2015/02/GARE-Resource_Guide.pdf*.

to ensure their communities thrive. With this Scoping Plan, the state also adds a new tool to identify which communities will be the least resilient in the face of selected climate impacts and will see disproportionate economic impacts as a result. As described in Chapter 3, the CVM will enable the state to target programs and policies to build resiliency in the specific regions that will feel climate impacts more acutely due to existing health and opportunity disparities leading to disproportionate economic impacts. This tool will be critical in the state's efforts to address climate impacts while accounting for environmental injustices and racial inequities. CARB will incorporate the CVM into its work as it moves forward and will share this new tool with other agencies to align our efforts. The goal is to keep expanding the CVM to incorporate additional climate impacts to better identify disproportionate economic impacts as community level data becomes available.

AB 617 is another important tool for both Air Districts and CARB to bring resources to communities that have long been disproportionately burdened by poor air quality. While AB 617 does not require local agencies to participate in the Community Air Protection Program, several AB 617 communities are finding ways to bring local land use agencies to the table to respond to community priorities. We look forward to more opportunities to foster relationships with local authorities and continued collaboration between state and air district programs.

In alignment with AB 32, and to ensure environmental justice and racial equity were integrated into this Scoping Plan, CARB reconvened the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB on the development of this Scoping Plan. Since reconvening in May 2021, the EJ Advisory Committee has engaged in the following activities:

- In October 2021, the EJ Advisory Committee sent a letter to the governor requesting a timeline extension for the Scoping Plan process. In response to the EJ Advisory Committee's letter, CARB modified this Scoping Plan process[519] and committed to an active engagement with the EJ Advisory Committee following the approval of this Scoping Plan. The EJ Advisory Committee also presented to the CARB Board[520] at its October 2021 Board meeting, reiterating its request for a timeline extension, as well as sharing additional concerns about process.

[519] Randolph, L. M. 2021. LMR October 19 response to Environmental Justice Advisory Committee Letter. *https://ww2.arb.ca.gov/sites/default/files/2021-10/LMR%20October%2019%20response%20to%20EJAC%20Letter%20Final.pdf*.

[520] Argüello, M. D., K. Hamilton, S. Taylor, and P. Torres. 2021. EJ Advisory Committee Co-Chair Informational Presentation to CARB Board. October 28. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2021/102821/21-11-4pres.pdf*.

- In December 2021, the EJ Advisory Committee shared its responses to Scenario Input Questions,[521] as well as a narrative document outlining their concerns[522] around the process, the need for evaluation, and the need for a tribal representative. In response to the EJ Advisory Committee Scenario Input Questions, CARB incorporated the EJ Advisory Committee responses into the Scenario Assumptions document,[523] and modeled results from PATHWAYS.[524] In response to the EJ Advisory Committee's concerns, CARB worked diligently to appoint a tribal representative[525] in February 2022, and to outline additional opportunities for the EJ Advisory Committee to engage in the Scoping Plan process.[526]
- In March 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[527] and walked through their preliminary draft recommendations to inform this Scoping Plan. In April, the EJ Advisory Committee shared its revised preliminary draft recommendations[528] to inform this Scoping Plan.
- In September 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[529] and engaged in discussion about priority items as they relate to incorporating environmental justice into the Scoping Plan. By the end of September, the EJ Advisory Committee shared its final

[521] EJ Advisory Committee. 2021. EJ Advisory Committee Final Responses to CARB Scenario Inputs. December 2. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf*.

[522] EJ Advisory Committee. 2021. EJ Advisory Committee Responses to Scenario Input Questions. EJ Advisory Committee narrative document regarding scenario input recommendations. December 1. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Narrative%20Document%20re%20Scenario%20Input%20Recommendations%2012_1_2021.pdf*.

[523] CARB. 2021. PATHWAYS Scenario Modeling. *https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf*.

[524] E3. 2022. CARB Draft Scoping Plan AB32 Source Emissions Initial Modeling Results. March 15. *https://ww2.arb.ca.gov/sites/default/files/2022-03/SP22-Model-Results-E3-ppt.pdf*.

[525] CARB. AB32 EJ Advisory Committee Meeting, February 28, 2022 CARB Update. *https://ww2.arb.ca.gov/sites/default/files/2022-02/CARB%20EJAC022822presentation.pdf*.

[526] Fletcher, C. 2021. CARB Response to EJ Advisory Committee Narrative. CARB. December 15. *https://ww2.arb.ca.gov/sites/default/files/2021-12/CARB%20response%20to%20EJAC%20Narrative.pdf*.

[527] EJ Advisory Committee. 2022. EJ Advisory Committee Presentation: Preliminary Draft Recommendations. March 10. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacpres.pdf*.

[528] AB 32 EJ Advisory Committee. Draft Recommendations. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacrecsrevised.pdf*.

[529] EJ Advisory Committee. 2022. EJAC Presentation. September 1. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/ejacpres.pdf*

recommendations[530] to inform this Scoping Plan. To the extent possible, CARB has incorporated and cited these recommendations through this Scoping Plan.

In addition to the activities listed above, Central Valley EJ Advisory Committee members hosted a successful community engagement workshop[531] in San Joaquin Valley in February 2022 with over 100 attendees. Members of EJ Advisory Committee hosted a statewide community engagement workshop[532] in June 2022 with more than 165 attendees. Throughout the EJ Advisory Committee's process, members of the Committee continued to work with their communities to ground truth their recommendations to inform the development of the Scoping Plan. The EJ Advisory Committee worked hard to ensure the voices of those communities most burdened by climate impacts were reflected in the plan. The EJ Advisory Committee will continue to play an ongoing role in the implementation of this Scoping Plan to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us.

To the extent possible, the EJ Advisory Committee's recommendations were integrated throughout the plan. This plan directly cites instances where there is alignment between the plan and the EJ Advisory Committee recommendations. This approach seeks to ensure there is more transparency and identify consensus that exists, as well as relevant ways equity and environmental justice are addressed in this plan and in the planning for future related implementation activities. CARB is dedicated to its efforts to ensure this plan does not leave communities behind.

As this Scoping Plan moves into the implementation phase, there will be a need to better understand how to address EJ Advisory Committee recommendations on the following topics:

- Actions under the jurisdiction of other agencies: there are certain EJ Advisory Committee recommendations that are outside of CARB's jurisdiction. As the EJ Advisory Committee continues to convene, it would be helpful to understand the

[530] EJ Advisory Committee. 2022. EJAC 2022 Scoping Plan Recommendations. September 30. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf

[531] San Joaquin Valley Climate Justice & the Scoping Plan. 2022. https://ww2.arb.ca.gov/sites/default/files/2022-07/SJV%20Climate%20Justice%20%26%20the%20Scoping%20Plan%20Workshop%20Report%20out%20%26%20Recommendations_5.2022.pdf

[532] EJAC. 2022. *EJAC/Community Engagement Synthesis Report '22.* https://ww2.arb.ca.gov/sites/default/files/2022-07/EJAC-CommunityEngagement-SynthesisReport-2022-English%26Spanish.pdf.

role that CARB can play as it relates to the EJ Advisory Committee's recommendations for actions outside CARB's jurisdiction and coordinates with sister agencies.

- Actions that require legislative direction: there are certain EJ Advisory Committee recommendations that would require legislative action. As the EJ Advisory Committee continues to convene, it will be helpful to understand how CARB can work with the EJ Advisory Committee to share these recommendations with the appropriate members of the Legislature.
- Actions directly tied to implementation activities: This Scoping Plan is not an implementation document; it is a plan to chart a course to continue to reduce GHG emissions and achieve carbon neutrality. Once the Scoping Plan is approved, there will be follow-up action at CARB, as well as at other agencies. In these follow-up efforts, there will be a role for ongoing EJ Advisory Committee engagement.
- Actions to implement recent legislation, such as SB 905.

CARB proposes to continue to work with the EJ Advisory Committee to better understand how to move forward on EJ Advisory Committee recommendations that fall into the topics listed above and any other recommendations that were not included in this plan. It is also important to note that there are numerous recommendations where CARB shares the goals of the EJ Advisory Committee and can assist in implementation steps. Examples include the following:

- CARB shares the goal of prioritizing non-fossil energy generation and supports non-fossil projects and opportunities to locate behind-the-meter clean resources in communities of concern in programs such as the Solar on Multifamily Affordable Housing program.
- CARB will engage with agencies and academic institutions to further workforce development.
- Many other recommendations related to financial support for various energy projects, such as microgrids, are within the purview of the CPUC or local publicly owned utilities. Similarly, utility scale projects are within the jurisdiction of other agencies. However, CARB supports strategies identified in the recommendations such as offshore wind to reduce the reliance on fossil fuel generation.
- CARB is supportive of rooftop solar, although it is not within CARB's jurisdiction to determine how incentives for those projects are structured.
- CARB is supportive of strong energy decarbonization goals, recognizing that increased reliance on electrification in transportation and other sectors will create significant demand for electricity, and therefore ensuring reliability of a decarbonized grid is a critical need for the state.
- In the transportation sector, CARB is supportive of the EJ Advisory Committee's recommendations to maintain aggressive zero emission vehicle goals consistent

with its statutory mandate to ensure regulations are technologically feasible and in alignment with Governor Newsom's ZEV Executive Order (EO N-79-20). CARB looks forward to continued engagement on rulemakings that will implement these goals.

- As noted elsewhere in this plan, CARB is supportive of the Caltrans California Transportation Plan 2050 and the California Climate Action Plan for Transportation Infrastructure.
- CARB is supportive of additional public support for transit. CARB is supportive of locating EV charging in low-income communities and communities of color.
- CARB is supportive of prioritizing funding incentives for transit and heavy- and medium-duty vehicles, although CARB does believe there is an important role for incentives that support adoption of light-duty vehicles for the time being. CARB will also be opening a rulemaking on the Low Carbon Fuel Standard to ensure it continues to support clean fuels that will displace petroleum fuels and will consider the EJ Advisory Committee recommendations on this program.
- In the industrial sector, in addition to the strategies discussed more fully in this Scoping Plan, CARB continues to work with the Legislature, local agencies, and air districts to support, implement, and enforce effective reductions in emissions of GHGs and air pollutants in stationary sources. The air districts have the authority to directly issue permits addressing a facility's criteria pollutant and toxics emissions levels. These levels are set after careful permit review, under district regulation and statute. However, AB 617 directs and authorizes CARB to take several actions to improve data reporting from facilities, air quality monitoring, and pollution reduction planning for communities affected by a high cumulative exposure burden. CARB will continue to implement AB 617 and look for ways to strengthen the Community Air Protection Program.
- Considerations around the phaseout of oil and gas extraction and refining, and the role of carbon capture are discussed more thoroughly in Chapter 2.

As CARB continues to engage with the EJ Advisory Committee—in addition to the EJ Advisory recommendations that have been integrated throughout this plan—below are the following commitments that CARB is making to ensure that environmental justice is integrated in this plan and its implementation:

- Building decarbonization is a pillar of this Scoping Plan and CARB commits to working closely with state and local agencies to implement the EJ Advisory Committee recommendations that call for prioritization for residents in low-income communities and communities of color in this transition.
- CARB commits to sharing the EJ Advisory Committee's recommendations with the CEC, CPUC, and other agencies administering funds to support building

decarbonization, and to work closely with those agencies as they engage in public processes to further building decarbonization.

- CARB has committed to review the Cap-and-Trade program and determine what potential legislative or regulatory amendments could be necessary to ensure the program continues to deliver GHG reductions needed to achieve the statutory climate goals. In that process, CARB will consider the recommendations of the EJ Advisory Committee[533] and Independent Emissions Market Advisory Committee,[534] as well as others.

Critically, the EJ Advisory Committee makes numerous recommendations centered around tracking progress of the various strategies in this Scoping Plan. Currently, progress is tracked and reported in numerous ways, including the annual GHG inventory and reports to the Legislature. Part of the ongoing work of implementation, however, will include consideration of ways to provide more data and information to the public, such as rates of deployment of clean energy and technology as described in Chapter 1. CARB will also continue to collaborate with CDPH and OEHHA on health metrics to track cumulative benefits of air pollution and climate programs, especially in low-income communities and communities of color.

As noted earlier in this document, the EJ Advisory Committee will continue to play a vital role in the Scoping Plan and its implementation to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us. This includes ongoing EJ Advisory Committee engagement to advise CARB on the development of the Scoping Plan and any other pertinent matters in implementing AB 32. The ongoing EJ Advisory Committee will help to ensure integration of environmental justice in implementation efforts as it relates to AB 32, and also help CARB as we work toward a future where race is no longer a predictor for life outcomes.

Academic Institutions and the Private Sector

Academic institutions produce and present the latest science on both the impacts of, and actions to reduce, climate change damages. They are also leading the way by

[533] California Legislative Information. Bill Text – AB 32. Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32*.

[534] California Legislative Information. Bill Text – AB 398. California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. (AB 398). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398*.

establishing their own climate goals and GHG emissions reductions targets.[535, 536, 537] They are incubators for innovation and knowledge in clean energy and technology and play an important role in adding to the wealth of robust information to inform policies and programs. Academic institutions have the ability to fill knowledge gaps and push us toward new frontiers. As we move forward, we will continue to see these institutions as partners and resources that can help CARB look for ways to accelerate and introduce actions to reduce GHG emissions and remove and store carbon.

As such, it will be important to maintain and enhance relationships with academic institutions, including community colleges. Community colleges are more likely to have a large proportion of first generation students or students that come from low-income communities or communities of color. The perspective of this diverse student body will be critical to inform discussions on climate change damages and mitigation efforts. This student body is also a future workforce, and courses to teach the skills for a sustainable economy are a chance to close historical opportunity gaps. Importantly, many of the students at community colleges are local residents and community members. This engagement provides another way to invest in communities across our state. The Foundation for California Community Colleges is already leading the way through innovate programs such as their Good Jobs Challenge - California Resilient Careers in Forestry.[538] These types of programs could be replicated across other sectors. CARB will evaluate how to leverage the requirements in AB 680 on workforce development in the California Climate Investments programs with the work at the Foundation for California Community Colleges.

As noted in Chapter 1, public and private partnerships will be important as we move forward in the great energy transition. But the private sector is also important in the context of research and development and deployment. Many of these companies have the resources and expertise to build and produce the clean technology and energy we will need. It was through the efforts of several private companies (Bell, Exxon, Telecom

[535] University of California. Our Commitment. *https://www.universityofcalifornia.edu/initiative/carbon-neutrality-initiative/our-commitment*.
[536] California State University. Energy, Sustainability, & Transportation. *https://www.calstate.edu/csu-system/doing-business-with-the-csu/capital-planning-design-construction/operations-center/Pages/energy-sustainability.aspx*.
[537] California Community Colleges Chancellor's Office. Climate Action and Sustainability. *https://www.cccco.edu/About-Us/Chancellors-Office/Divisions/College-Finance-and-Facilities-Planning/Facilities-Planning/Climate-Action-and-Sustainability?msclkid=4a72350ec4f511ecaf292c6b14ac9a4f*.
[538] Foundation for California Community Colleges. 2022. Good Jobs Challenge. Developing Resilient Careers in Forestry for Californians. *https://foundationccc.org/What-We-Do/Workforce-Development/Good-Jobs-Challenge*.

Australia) that the photovoltaic solar panels in use today were developed.[539] Similarly, it was companies such as General Electric and Texas Instruments that contributed to the development of hydrogen fuel cells.[540] This Scoping Plan includes the known and emerging clean technologies and fuels available today. The private sector spirit of invention, improvement, and innovation must continue to deliver new tools in the fight against climate change.

Individuals

This Scoping Plan not only projects ambitious availability of clean technology and energy, but also includes aggressive assumptions about consumer adoption of ZEVs, heat pumps, and other energy efficiency practices, among others. When it comes to climate change mitigation, the sum of the parts matters. Only when we add up the impacts of the choices we make do we understand the true impact on GHG emissions. Today, many Californians have opportunities to choose between driving a car, taking a bus, biking, or walking. Many can choose to install a heat pump or buy an electric cooktop. Together, we can increase these opportunities and pick the future we want. We can start or transform businesses that create clean jobs, innovate new technologies, or introduce new systems. We can engage with fellow workers to support durable paths for labor in a clean economy. And we can choose to engage with our community, tribes, and our governments to advocate for change, call out challenges, and propose solutions. Our choices will help determine California's climate future. Down one path is a future of climate impacts that will continue to worsen and further increase disparities across communities. Down the other is a future that avoids the worst impacts of climate change, improves air quality—especially for the most burdened communities—and fosters new economic and job opportunities to support a sustainable economy.

Importantly, we must acknowledge that historical decisions have resulted in health and opportunity gaps for residents in low-income communities and communities of color. Not everyone has the resources or access to make these choices—to buy a ZEV, install a heat pump, or use public transit to get to work. It is here that government can help. Government, at multiple levels, can fund programs and structure policies to provide consumers with more choice and to support them in adopting cleaner technology options. Whether through affordable energy rates or assistance in purchasing zero emission vehicles and appliances, we can use the transition to a carbon neutral economy as an opportunity to close some of these persisting opportunity gaps. By acting now, we can

[539] Californiasolarcenter.org. Passive Solar History. *http://californiasolarcenter.org/old-pages-with-inbound-links/history-pv/*.
[540] Fuel Cell Store. History of Fuel Cells. *https://www.fuelcellstore.com/blog-section/history-of-fuel-cells?msclkid=04a19450c50211ec8d20f2afff4039fe*.

change our planet’s fate and build a more resilient, healthier, and equitable future for all Californians.

Appendix C
Biological Resource Reports

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Appendix C1
Biological Resources Compendium Report

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2023–2026 Biological Resource Studies Compendium

Euismod Project
Kern County, CA

June 5, 2026

Prepared For:

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EXECUTIVE SUMMARY

This report describes the biological resource studies conducted for the Euismod Project and the results of those studies including habitat characterizations and species observed or likely to occur on or adjacent to the Project with focus on the potential for special status species or habitats. In addition, this report quantifies anticipated Project impacts on creosote bush scrub vegetation community, western Joshua trees, and jurisdictional waters, based on the latest available Project design information. The Euismod Project is a proposed battery energy storage development located on ten privately owned parcels comprising approximately 120 acres in the Willow Springs area of eastern Kern County. The Project would utilize lithium-ion batteries housed in purpose-built containers and ancillary equipment to store energy received from the regional electric grid to then be returned to the grid when needed. Based on the preliminary Site Plan, the on-site disturbance footprint will encompass approximately 105.6 acres of the 120-acre Site. Up to approximately 6.15 additional acres could be impacted offsite for construction and operation of two 220 kilovolt (kV) overhead electric tie-lines extending from the Project Site to the existing Southern California Edison (SCE) Whirlwind Substation located on adjacent parcels to the south.

Key conclusions of Project biological surveys are presented below:

- The vegetation community on the 120-acre Site and surrounding lands is mature creosote bush scrub with scattered Joshua trees and two patches of cheesebush-sweetbush scrub. The creosote bush scrub community is dominated by creosote (*Larrea tridentata*), commonly 8 to 10 feet tall. The cheesebush-sweetbush community is dominated by cheesebush (*Ambrosia salsola*). Both shrub communities were open; shrubs were typically spaced 4 feet to 15 feet apart. Disturbed lands occur on and around the Site from domestic animal grazing, unpaved roads and trails, and utility infrastructure.
- A western Joshua tree (*Yucca brevifolia*) census was conducted in 2024 following California Department of Fish and Wildlife (CDFW) protocol and documented 419 trees within the 120-acre Site and surrounding 50-foot buffer. Three hundred and sixteen of the trees are in the planned Project disturbance footprint and will be removed, with some relocated. The western Joshua tree is a Candidate for listing by the State and also protected under the Western Joshua Tree Conservation Act and California Desert Native Plants Act. No western Joshua trees occur within 50 feet of the proposed tie-lines.
- Focused rare plant surveys were conducted in 2024 and 2025 and no rare plants were identified on the Site or adjacent lands.
- Two protocol Mojave desert tortoise (*Gopherus agassizii*) surveys have occurred and no individuals or recent sign of occurrence of tortoise or any other Federal or State listed Threatened or Endangered species has been identified on or adjacent to the Site. Mojave desert tortoise is listed as a State Endangered and Federally Threatened species.
- Burrowing owl (BUOW; *Athene cunicularia*), a Candidate for State listing, has not been observed on or within 500 feet of the Site during any of the biological resource studies including focused BUOW surveys in 2024 and 2025, but whitewash observed at two burrows indicates the Site area has been used by BUOW in the past. The habitat is of

low quality for BUOW due to having mature, tall vegetation, few suitable burrows, and ample habitat for predators. The only BUOW observed during any of the Project field surveys was one individual spotted in flight crossing 170th street west approximately 0.75 mile south of the Project Site.

- A Swainson's hawk (SWHA; *Buteo swainsoni*) nesting habitat assessment was conducted for the Site area in 2024 and a protocol SWHA nest survey was conducted in 2025 and no active SWHA nests or nesting behavior was observed within 5 miles of the Site. SWHA is listed as a State Threatened species and federally protected under the Migratory Bird Treaty Act.
- The Project will impact up to 3.55 acres of ephemeral streambed falling under the jurisdiction of CDFW
- The Project will impact up to 0.86 acre of ephemeral streambed falling under the jurisdiction of the Regional Water Quality Control Board.

The Project Proponents have been meeting with CDFW to consult on the Project and survey results described herein, and submitted Incidental Take Permit applications to CDFW for BUOW under the California Endangered Species Act and western Joshua tree under the Western Joshua Tree Conservation Act. Applications for streambed alteration and grading in Waters of the State will also be submitted to CDFW and the Regional Water Quality Control Board, respectively. Additional biological resources conservation measures are included in the Project Description submitted for the Project's Conditional Use Permit and summarized herein.

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ACRONYMS AND ABBREVIATIONS

Notation	Definition
BUOW	Burrowing owl (*Athene cunicularia)*
CAL-IPC	California Invasive Plant Council
CDFW	California Department of Fish and Wildlife
CDNPA	California Desert Native Plants Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CNDDB	California Natural Diversity Database
Project	Euismod Project
Rincon	Rincon Consultants, Inc.
RWQCB	Regional Water Quality Control Board
SCE	Southern California Edison
Site	location of the Euismod Project
SWHA	Swainson's hawk
USFWS	U.S. Fish and Wildlife Service
WJTCA	Western Joshua Tree Conservation Act
WOS	Waters of the State

1.0 Introduction

The Euismod Project (Project) is a proposed battery energy storage development located on 10 privately owned parcels comprising an approximately 120-acre site (Site or Project Site) in the Willow Springs area of the Antelope Valley in eastern Kern County, California (Figures 1, 2, and 3). The Project would utilize lithium-ion batteries housed in purpose-built containers and ancillary equipment to store energy received from the regional electric grid to then be returned to the grid when needed. The Project Site is located on parcels adjacent to the Whirlwind Substation and the Project includes two overhead 220 kilovolt (kV) electric tie-lines that will connect the Project to the adjacent Southern California Edison (SCE) Whirlwind Substation (Figure 3). Based on the Preliminary Site Plan, the disturbance footprint will encompass approximately 105.6 acres of the approximately 120-acre Site. Up to 6.15 additional acres could be disturbed off-Site on the adjacent SCE property for construction and operation of the two electric tie-lines.

The biological resources on the Project Site and surrounding lands are well understood from the biological resource surveys summarized in this report, discussions with California Department of Fish and Wildlife (CDFW), published information and jurisdictional agency databases, and information from numerous large renewable energy projects that have been developed in the region. Biological resource studies that have been completed for the Project include:

- Two general biological resource assessments in 2023 and 2024, respectively, collectively encompassing most of the approximately 120-acre Site and the electric tie-line routes.
- Two focused rare plant surveys in 2024 and 2025, respectively, with the 2024 survey covering most of the Project Site and a 50-foot buffer, and the 2025 survey covering all of the Project Site and a 100-foot buffer and the electric tie-line routes.
- A focused Habitat Assessment for BUOW, desert kit fox, and American badger in 2024 covering the approximately 120-acre Project Site and a 500-foot buffer.
- A focused BUOW survey was conducted in 2025 covering the approximately 120-acre Project Site, a 500-foot buffer, and the electric tie-line routes.
- Two focused desert tortoise surveys in 2024 and 2025, respectively, with the 2024 survey covering the approximately 120-acre Project Site and a 500-foot buffer, and the 2025 survey covering the Project Site, a 100-foot buffer, and the electric tie-line routes.
- A Nesting Habitat Assessment for Swainson's hawk (SWHA; *Buteo swainsoni*) in 2024 covering lands within 1 mile of the Project Site.
- A focused SWHA Nest Survey in 2025 covering lands within 5 miles of the Project Site.
- A Western Joshua Tree Census was completed in 2024 covering the approximately 120-acre Project Site and a 50-foot buffer.
- A western Joshua tree survey was completed in 2026 covering the electric tie-line routes.
- A delineation of waters subject to State jurisdiction was completed in 2024 and updated 2026.

The methods and results of these studies are summarized in the following Sections 3.0 and 4.0, respectively. Copies of each of the studies described in Section 3.0 and 4.0 are provided in Appendix A. The 2023 and 2024 biological surveys for the Project were conducted concurrently with early project planning and land acquisition. During this time, the boundaries of lands planned for development were changing so the study areas varied with land planning. Some of the studies included field survey of an optional access road corridor that was under consideration for the Project but later determined unneeded and eliminated from Project planning (Figure 4). By summer 2024, the 120-acre Site was defined and biological resources surveys since that time have encompassed the entire Site and adjacent lands as required by relevant survey protocols outward to as much as 5 miles. Figure 5 shows the study areas for each of the surveys addressing vegetation, and Figures 6 and 7 show the study areas for each of the surveys addressing wildlife.

2.0 Study Scope Methodologies

The following sections describe the scope and methodologies used for the Project's biological resource studies completed to date. As described in Section 1.0, biological resource surveys conducted for the Project have been occurring since early project planning and span 2023, 2024, 2025, and early 2026. Scope and methodology descriptions below present studies conducted in chronological order, and the earliest studies were general biological resource assessments used along with input from CDFW to direct the latter studies to focus on sensitive plants or plant communities and special status wildlife with potential to occur in the Project vicinity.

2.1 2023 Biological Resources Assessment (TRC, 2023)

This desktop and field survey documented plants, vegetation communities, habitats, and wildlife on approximately 34 acres in the western portion of the Project Site and a surrounding 150-meter (500-foot) buffer and SCE lands between the Project Site and the Whirlwind Substation (study area). This initial Project biological resource assessment was conducted as part of initial project planning that was based on the 34-acre area and the west electric tie-line. This field survey was completed April 18, 2023, during the active season for many wildlife species and the blooming period for many plants in the Site region. The field survey consisted of meandering east-west pedestrian transects visually scanning the landscape and observing and listening for wildlife activity including bird songs as well as animal "rustles." Binoculars and a 10x magnifier were used as necessary to identify wildlife and plants. The study characterized vegetation communities and habitats, inventoried plant and animal species observed, and surveyed the Site for protected habitats, species, or their sign.

2.1.1 2024 Biological Resources Assessment (TRC, 2024a)

This desktop and field survey documented plants, vegetation communities, habitats, and wildlife on approximately 40 acres in the eastern portion of the Project Site and a surrounding 150-meter buffer and SCE lands between the Project Site and the Whirlwind Substation (study area). This biological resource assessment was conducted when the 40-acre area was identified for project development along with the east electric tie-line. This field survey was completed on February 2, 2024. The field survey consisted of meandering pedestrian transects, visually scanning the landscape and observing and listening for wildlife activity including bird songs as well as animal "rustles." Binoculars and a 10x magnifier were used as necessary to identify wildlife and plants. The study characterized vegetation communities and habitats,

inventoried plant and animal species observed, and surveyed the Site for protected habitats, species, or their sign.

2.1.2 2024 Rare Plant Survey (TRC, 2024b)

This study included a desktop investigation and two field surveys focused on habitat assessment and surveys for rare plants. The first survey occurred on April 30, May 1, and May 3, 2024, and encompassed approximately 64 acres of the Site and an adjacent 50-foot buffer. The second survey occurred on May 29 and 30, 2024 and encompassed the same 64-acre area plus an additional approximately 15 acres of the Site and an adjacent 50-foot buffer. Timing of the surveys corresponds to the blooming season for most of the rare plants with potential to occur in the Site region. The field survey consisted of meandering pedestrian transects visually scanning the landscape for novel plant species, paying particularly close attention to areas in and around ephemeral streambeds. All observed records were collected on a Geode-equipped Samsung tablet and/or iPhone for submeter accuracy. A 10x magnifier was used as necessary to identify plants. This study provides a detailed habit description and characterizes vegetation communities and habitats, inventoried plant species observed, and surveyed the Site for special status plants or their sign. All plants observed were recorded. All wildlife observed was also recorded, but animal observations were incidental to the plant survey.

2.1.3 2024 Habitat Assessment and Burrow Survey for BUOW, Desert Kit Fox and American Badger (Rincon Consultants, Inc., 2025b)

This desktop and field survey focused on burrows and habitat potentially suitable for BUOW, desert kit fox (*Vulpes macrotis*), and American badger (*Taxidea taxus*) on the approximately 120-acre Site and a surrounding 500-foot buffer. American badger is designated as a California Species of Special Concern. This survey included desert kit fox and American badger not because the Project site had been identified as potential habitat, but instead because the additional observations for kit fox and badger sign can be made incidental to the BUOW survey at no additional cost. For BUOW, the habitat assessment and burrow survey methodology was conducted in accordance with guidelines in the CDFW staff report on BUOW mitigation (CDFW, 2012). Vegetation communities, plants, and wildlife were observed and documented and burrows potentially providing habitat for these species were observed, recorded and evaluated. This field survey was completed on April 9 to 11 and May 30, 2024, during the active season for many wildlife species and the blooming period for many plants in the Site region. Observations were made using pedestrian transects spaced to allow 100 percent visual coverage of the ground surface in areas where the habitat assessment determined suitable habitat was present. The transect interval was 10 meters, or less where necessary, to account for differences in terrain, vegetation density, and ground surface visibility. Biologists documented potential BUOW, desert kit fox and American badger burrows and species sign using ArcGIS field maps and noted general site characteristics, predominant vegetation communities, and observations of flora and fauna.

2.1.4 2024 Protocol Desert Tortoise Survey Report (Rincon Consultants, Inc., 2025a)

This desktop and field survey included literature and records review for desert tortoise and field survey of the approximately 120-acre Site and a surrounding 500-foot buffer. This field survey was completed April 9 to 11 and May 30, 2025. The survey adhered to the U.S. Fish and Wildlife Service (USFWS) methodology for projects less than 65 hectares (USFWS, 2019). The field survey was conducted with 10-meter belt transects to achieve 100 percent visibility of

potentially suitable habitat on Project lands and within 500 feet where there was permission for access. The focused survey for desert tortoise included documenting observed vegetation communities, flora, fauna, burrows, and wildlife sign using ArcGIS Field Maps. 2024 Nesting Habitat Assessment for SWHA (Rincon Consultants, Inc. [Ricon], 2025c)

This desktop and field survey included literature and records review for SWHA, listed as State Threatened and federally protected under the Migratory Bird Treaty Act, and field survey of SWHA nesting habitat on the 120-acre Site and the surrounding area within 1 mile. This field survey was completed April 9 and 11, 2025. The survey included walking the Site area and driving on existing roads within the 1-mile radius, adhering to the methodology outlined in *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California* (California Energy Commission [CEC] and CDFW, 2010). The study area is shown in Figure 7. These surveys were conducted with binoculars and spotting scopes to aid in bird or nest detection. Potential nesting sites, including suitable structures and trees, were assessed for active or inactive SWHA or other raptor nests during the survey. Vegetation was also observed and documented and assessed for SWHA nesting potential.

2.1.5 Western Joshua Tree Census (Phoenix Biological Consulting, 2024)

A western Joshua tree (*Yucca brevifolia*) census following CDFW guidance (CDFW, 2026a) was conducted from November 21 through November 24, 2024, for the 120-acre Site and the surrounding area within 50 feet. Each Joshua tree in the study area was located and documented. Pedestrian transects located no more than 75 feet apart were used to allow each individual Joshua tree to be readily observed. Data were collected from ArcGIS field maps. An Eos Arrow 100 Submeter high Resolution GPS was used to provide accuracy of tree location between 1 meter and 25 centimeters. For each tree, documentation collected includes:

- Tree live or dead;
- Tree maturity (tree branched or unbranched);
- Evidence of flowering or fruit;
- Height Class (A = less than 1 meter; B = 1 to 5 meters; C = greater than 5 meters); and
- Photographic record.

2.1.6 2025 Protocol Western Burrowing Owl Habitat Assessment and Survey (Aardvark Biological Services, 2025d)

This desktop and field survey included literature and records review and field surveys following CDFW protocol for western burrowing owl (BUOW; *Athene cunicularia)*. The field surveys included the 120-acre Site, the electric tie-line routes, and a 500-foot buffer. Field surveys followed guidance for breeding season surveys from CDFW's staff report on BUOW mitigation (2012) including the scheduling for four surveys that were conducted between April 7 and June 16, 2025. Survey 1 included belt transects throughout the study area to observe and document general habitat and vegetation with focus on BUOW habitat assessment and observation for BUOW, BUOW sign, potentially suitable burrows, and BUOW predators. Survey 1 was conducted with belt transects 10 meters apart for the Project Site and a 100-foot buffer, and 20-meter-wide belt transects were used to survey the buffer from 100 to 500 feet from the Project Site and tie-lines where feasible and not limited by private property. Surveys 2-4 focused on

three suitable burrows identified by Survey 1 (Burrow Nos. 3, 7, and 8 in Figure 8) and an approximately 1,000-foot radius around each burrow. Surveys 2–4 included 20-meter-wide belt transects around the three suitable burrows and one- to two-hour survey observations at suitable burrows. Observations of the general habitat and vegetation and any BUOW sign, individuals, or suitable burrow, were recorded. Observation and sign of BUOW predators were also recorded. Surveyors used high-resolution binoculars and spotting scopes and stopped and scanned at the end and beginning of each transect or at least every 100 meters. Attention was also paid to BUOW vocalizations.

2.1.7 2025 Protocol Mojave Desert Tortoise Survey (Aardvark Biological Services, 2025a)

This study included literature and records review and pre-Project protocol field surveys for Mojave desert tortoise (*Gopherus agassizii*), a species listed as State Endangered and Federally Threatened. The field surveys occurred April 7 to 10 and May 6, 2025, and included the 120-acre Site, the electric tie-line routes, and adjacent buffers. Ten-meter-wide belt transects were used on the Site and tie-line routes and outward to include an adjacent 100-foot buffer. A buffer area outward from 100 to 500 feet was surveyed using 20-meter-wide belt transects. Field surveys were conducted in April and May during the desert tortoise active season and in preferred temperatures. This protocol survey was to determine if desert tortoises are present, estimate the number present, if any, and provide information on habitat conditions. The Site and 100-foot buffer survey followed USFWS survey methods for projects less than 65 hectares (USFWS, 2019), with data collection and categorization based on the USFWS *Desert Tortoise (Mojave Population) Field Manual* (USFWS, 2009). Observations focused on the potential presence or sign of desert tortoise, as well as the general habitat characteristics relevant to suitability for desert tortoise, including vegetation present, potential cover sites, substrate and burrow conditions, and sign or presence of tortoise predators.

2.1.8 2025 Rare Plant Survey (Aardvark Biological Services, 2025b)

This study included literature and records review, visiting reference sites, and protocol field surveys for protected plants. The field surveys occurred May 3 to 5, 2025, and included the 120-acre Site, the electric tie-line routes, and an adjacent 100-foot buffer. The field survey consisted of a full coverage survey using systematic 10-meter parallel line transects and following protocols recommended by CDFW (2018). The field survey was floristically based, that is, botanists identified and documented all plant species observed during the survey, whether fresh or dried, to at least genus and to the level necessary to ensure they were not plant species of concern. Plants not readily identified in the field were collected and later identified. The field surveys focused on observation for the potential presence of special status plants with potential to occur based on previous Site studies and a nine-quadrangle California Natural Diversity Database (CNDDB; CDFW, 2024a)) search and reference locations were visited for rare plants with recorded occurrences in the area and potential habitat in the study area.

2.1.9 2025 Swainson's Hawk Survey (Aardvark Biological Services, 2025c)

This study included literature and records review and protocol field surveys for SWHA nests for the 120-acre Project Site and a 5-mile radius. The desktop review for the 2025 study included review of results of the 2024 Nesting Habitat Assessment for SWHA (Rincon, 2025c), during which no SWHA or SWHA nest was observed on or within a 1-mile radius of the Site, and a CNDDB search for a 5-mile radius. The field surveys followed methods in CDFW's document *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for*

Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California (CEC, 2010). The protocol surveys occurred over 10 days and all four protocol survey periods from March to June. Period I is prior to SWHA adult arrival. The Period I survey focused on locating potential nesting habitat such as trees and structures and identifying competing species nests. The Period II, III, and IV surveys focused on observations for nesting behavior, including territories, courtship, nest building, breeding behavior, males returning to the nest during laying and incubation and, during Period IV, fledgling activity. The surveys focused on observations and listening for vocalizations. Driving surveys were primarily used, with walking surveys employed to more thoroughly examine areas or trees when driving was not as effective. Surveyors used high-quality binoculars and spotting scopes as needed to identify species and investigate potential nests. Observations of SWHA and their behaviors were recorded, as well as nest locations of other raptors and common ravens.

2.1.10 Aquatic Features Delineation (Mountainview Biological Consulting, Updated February 2026)

This study included review of aerial photographs, U.S. Geological Survey topographic maps, and agency soil and water databases and field survey. The field survey included the 120-acre Project Site, the tie-line corridors, and two 100-foot-wide corridors that were initially being considered for an access option but are no longer part of the project lands. The field survey was to evaluate drainages for the presence of riverine, riparian, or wetland habitat and jurisdictional waters as regulated by the U.S. Army Corps of Engineers as Waters of the United States, or by Regional Water Quality Control Board (RWQCB) as Waters of the State (WOS), or by CDFW as streambed subject to Fish and Game Code Section 1602. The surveys were conducted on foot and all limits were mapped using sub-meter GPS. The field delineation of jurisdictional waters on the Site occurred in summer 2024 with a verification site visit for WOS with RWQCB staff in summer 2025 and a verification visit for CDFW streambed jurisdiction with CDFW in January 2026. Aquatic features in the vicinity of the tie-lines were subsequently mapped in February 2026.

2.1.11 Tie-Lines Western Joshua Tree Survey (Jennings Environmental, February 2026)

This study included a pedestrian survey of lands within 50 feet of the proposed electric tie-lines for the presence or absence of western Joshua tree. No western Joshua tree data was recorded because no western Joshua trees were observed. The negative finding was documented (Jennings Environmental, 2026)

3.0 Findings

The studies described in Section 2.0, above, collectively provide detailed habitat and wildlife information over multiple seasons and encompass the entire 120-acre Project Site, the tie-line alignments, and surveyed buffer lands. Biological resources on the Project lands and surrounding buffer areas are described in the following sections based on the whole of the studies described in Section 2.0. Field studies were preceded by literature reviews including maps, aerial photographs, CNDDB, the USFWS' Information for Planning and Consultation (IPaC) database, and non-governmental databases including Calflora. The literature reviews were used to make preliminary assessments of the potential for occurrence of sensitive species in preparation for field observations. Field surveys were then conducted to determine whether individuals, sign, or suitable is actually present within the areas surveyed. Appendix B provides

a compendium of the special status plant and animal species considered during the studies described herein, and Appendix C provides the potential for occurrence based on the sum of information and field studies.

3.1 Vegetation Communities and Plants

Vegetation on the Project Site and tie-line corridors and buffer area out to 500 feet consists of mature Creosote Bush Scrub dominated by creosote (*Larrea tridentata*) commonly 8 to 10 feet tall, with two patches of cheesebush-sweetbush scrub. A herbaceous layer composed of seasonal annuals and perennial grasses occurs in the creosote bush scrub and the patches of cheesebush-sweetbush scrub. Both shrub communities were open; shrubs were typically spaced 4 feet to 15 feet apart.

Vegetation observed in the two communities was similar. The creosote bush scrub community (*Larrea tridentata* Shrubland Alliance) is dominated by creosote (*Larrea tridentata*) commonly 8 to 10 feet tall. Other shrubs observed within the study area predominantly included: rubber rabbitbrush (*Ericameria nauseosa),* winterfat (*Krascheninnikovia lanata*), and white bursage (*Ambrosia dumosa*). Native herbs predominantly consisted of common goldfields(*Lasthenia gracilis*), doveweed (*Croton setiger*), sandblossoms (*Linanthus parryae*), whitemargin sandmat (*Euphorbia albomarginata*), and anglestem buckwheat (*Eriogonum angulosum*). Non-native herbs and grasses were also present, and predominantly included tumble mustard (*Sisymbrium altissimum*), redstem filaree (*Erodium cicutarium*), cheat grass (*Bromus tectorum*), and red brome (*Bromus madritensis* ssp. *rubens)*. The cheesebush-sweetbush community (*Ambrosia salsola - Bebbia juncea* Shrubland Alliance) is dominated by cheesebush (*Ambrosia salsola*). The herbaceous layer species composition was similar to the Creosote Bush Scrub with common goldfields, cheatgrass, red brome, and tumble mustard being the most common. No other vegetation communities would be impacted by the Project. A compendium of plants recorded during the studies described herein is provided in Appendix B. The acreage of vegetation communities that will be disturbed by the Project based on preliminary engineering is provided below.

PLANT COMMUNITY & LOCATION	TOTAL ACRES	ACRES IN DISTURBANCE FOOTPRINT
Creosote bush scrub - onsite	112.23	98.24
Cheesebush-sweetbush scrub - onsite	8.12	7.37
Creosote bush scrub- offsite tie-lines	6.15	Up to 6.15
Cheesebush-sweetbush scrub - offsite tie-lines	0	0
TOTAL	**126.5**	**Up to 111.76**

The tie-line interconnections at the Whirlwind Substation would be in the Developed substation footprint where terrain consists of engineered soils and gravel surfacing maintained to control vegetation.

No sensitive natural communities or threatened, endangered, or rare plants have been observed, but western Joshua tree, a state Candidate for listing and protected under the Western Joshua Tree Conservation Act (WJTCA; CDFW, 2024b) and California Desert Native Plants Act (CDNPA) occurs sporadically throughout much of the 120-acre Project Site with western Joshua tree cover ranging over the Project Site between 0 and less than 1 percent. There are no trees other than western Joshua tree on or within 500 feet of the Project Site and tie-line routes.

Only one species of invasive plant was observed in the Project area, ripgut brome (*Bromus diandrus*), an invasive, non-native weed. Approximately 800 to 1,200 plants were observed along the west gen-tie corridor in the rock ditch line surrounding the SCE Whirlwind Substation and in an adjacent drainage. The California Invasive Plant Council (CAL-IPC, 2025), rates ripgut brome as "MODERATE," the median level of rating it gives for an invasive plant. Ripgut brome is an annual plant in the grass family (*Poaceae*). It is one of a number of European grasses that have displaced much of the native grasses and native annual and perennial herbaceous plants throughout California.

An invasive plant is defined by the CAL-IPC (2025) as:

> "plants that are not native to an environment, and once introduced, they establish, quickly reproduce and spread, and cause harm to the environment, economy, or human health. Also, they 1) are not native to, yet can spread into, wildland ecosystems; and 2) displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes."

3.2 Ripgut brome is naturalized throughout much of California and generally is not considered a high priority invasive species for treatment, hence the "moderate" rating by CAL-IPC. Wildlife

Most wildlife observed or detected during the survey were common native birds and small mammals. These included: common raven (*Corvus corax*), loggerhead shrike (CDFW species of special concern; *Lanius ludovicianus*), red-tailed hawk *(Buteo jamaicensis)*, white-crowned sparrow (*Zonotrichia leucophrys*), and blue-gray gnatcatcher (*Polioptila caerula*). Coyote (*Canis latrans*) scat was observed in the surrounding area. In addition, burrowing owl (*Athene cunicularia;* CDFW species of special concern) was observed in flight about 1,200 meters south of the Project Site heading west across 170th Street. A list of wildlife species observed or identified by sign during the survey is included in Appendix B. Habitat characterizations conducted in 2023 and 2024 identified habitat potentially suitable for rare plants, desert tortoise, BUOW, American badger and SWHA, and recommended focused surveys for them that were subsequently conducted. Results of focused studies for sensitive plants and animals are described in the following sections. With the exception of western Joshua Tree, none of the studies conducted for the Project resulted in the identification of any protected vegetation community or rare plant, nor Threatened, Endangered, or Candidate species, nor sign of recent presence thereof, on the Project lands or surveyed buffer areas out to 500 feet. A Loggerhead shrike (*Lanius ludovicianus*; a Species of Special Concern) was the only other sensitive species observed on or within 500 feet of the Project lands.

Project area does not include any important animal movement or migration pathway. There is ample room for wildlife movement throughout the area and no unique corridor on or near the Project development area. The drainages in the area are typically dry and do not have riparian corridors and drain to a manmade ditch at the Whirlwind Substation; therefore, they do not provide high-quality corridor habitat (TRC 2023, 2024a).

3.3 Rare Plants

The 2024 rare plant survey recorded 51 species of plants (TRC, 2024b). No special status plants or protected vegetation communities were observed except Joshua tree. Following the survey, two special status plant species that were not observed were still judged to have moderate potential to occur based on observed habitat observed. These species are Clokey's

cryptantha (*Cryptantha clokeyi*; a California Rare Plant Rank 1B.2 species) and Mojave spineflower (*Chorizanthe spinosa*; a California Rare Plant Rank 4.2 species). The potential for occurrence of these species was further addressed in the 2025 rare plant survey described below.

The 2025 rare plant survey recorded 64 taxa in 19 plant families, including seven non-native weedy species that are naturalized throughout much of California and not considered high-priority invasive species (Aardvark Biological Services, 2025b). Western Joshua tree was the only special status plant species identified. There were no rare plant species or sign thereof encountered during the survey. Following the literature search, including a review of the 2024 rare plant survey report and the field survey conducted in 2025, this study concluded Clokey's cryptantha (a California Rare Plant Rank 1B.2 species) and Mojave spineflower (a California Rare Plant Rank 4.2 species) were unlikely to occur on the Site, tie-lines, or 100-foot buffer. Two species were identified in the study area that are protected under the CDNPA, western Joshua tree and silver cholla. Two silver cholla were documented.

Based on the results of the 2024 and 2025 rare plant surveys, rare plants are not likely to occur on or adjacent to the Project Site or electric tie-lines.

3.4 Burrowing Owl, Desert Kit Fox, and American Badger

Each of the habitat and terrestrial wildlife studies conducted for the Project included observations for BUOW individuals or sign and suitable burrows. The surveys conducted over time have identified a total of eight burrows that could potentially be suitable for BUOW. Burrow observations are summarized in the Table 3-1. None of the burrows were occupied or accompanied by sign of presence. Burrow locations are shown in Figure 8. Findings of the two surveys that were focused on BUOW and followed guidance in CDFW's BUOW survey protocol (CDFW, 2012) are described in more detail below.

TABLE 3-1
SUMMARY OF OBSERVED AND CHARACTERIZED BURROWS
2023, 2024, AND 2025 BIOLOGICAL STUDIES

BURROW I.D.	OBSERVATIONS
1	• Old potential tortoise or badger burrow; D-shaped, collapsed, with no sign of use by desert tortoise or badger (TRC, 2024a). • Burrow not found in subsequent surveys.
2	• Small mammal burrow with no sign of BUOW, desert kit fox, or American badger (Rincon, 2025b). • Class 5 burrow (possibly desert tortoise; deteriorated, including collapsed) with no desert tortoise or sign of presence observed (Rincon, 2025a). • Burrow not found in 2025 and assumed collapsed and/or no longer exists (Aardvark Biological Services, 2025d).

BURROW I.D.	OBSERVATIONS
3	• Old collapsed burrow with old whitewash. No bones, feathers, pellets, other animal scat or other sign of recent burrowing owl presence (Rincon, 2025b). • Class 5 burrow (possibly desert tortoise; deteriorated, including collapsed) with no desert tortoise or sign of presence observed (Rincon, 2025a). • Potentially suitable BUOW burrow; partially collapsed with whitewash (Aardvark Biological Services, 2025d).
4	• Small mammal burrow with no sign of burrowing owl, desert kit fox, or American badger (Rincon, 2025b). • Class 5 burrow (possibly desert tortoise; deteriorated, including collapsed) with no desert tortoise or sign of presence observed (Rincon, 2025a). • Burrow not found in 2025 and assumed collapsed and/or no longer exists (Aardvark Biological Services, 2025d).
5	• Small mammal burrow with no sign of burrowing owl, desert kit fox, or American badger (Rincon, 2025b). • Class 5 burrow (possibly desert tortoise; deteriorated, including collapsed) with no desert tortoise or sign of presence observed (Rincon, 2025a). • Burrow not found in 2025 and assumed collapsed and/or no longer exists (Aardvark Biological Services, 2025d).
6	• Burrow with characteristic desert tortoise shape and no sign of BUOW owl, desert kit fox, or American badger (Rincon, 2025b). • Class 3 burrow (definitively tortoise; deteriorated, including collapsed) with no desert tortoise or sign of presence observed (Rincon, 2025a). • Burrow not found in 2025 and assumed collapsed and/or no longer exists (Aardvark Biological Services, 2025a and 2025d).
7	• Potentially suitable BUOW burrow with no BUOW sign (Aardvark Biological Services, 2025d).
8	• Potentially suitable BUOW burrow; partially collapsed with whitewash in Surveys 1, 2 and 3, and fully collapsed in Survey 4 (Aardvark Biological Services, 2025d).

The literature search for BUOW occurrences identified five records of BUOW within a 5-mile radius, including 2010–2011 sightings approximately 1.3 and 2 miles northeast of the Site, respectively, and 2007 sightings approximately 2.1 and 4.5 miles south of the Site. In addition, five burrows were identified on Site and adjacent to the Site in 2024 from previous project work (Rincon, 2025b). The desktop research and prior Project studies establish a history of no known previous observations or occurrences of live individuals within the Site or 500-foot buffer. As described in Section 2.1.3, the 2024 BUOW survey included observation for sign of desert kit fox and American badger as well. These species were included not because the Project site had been identified as potential habitat, but instead because the additional observations for kit fox and badger sign can be made incidental to the BUOW survey at no additional cost. No CNDDB occurrences for American Badger were identified within 3 miles of the Project Site. Desert kit fox records are not tracked by CNDDB; however, several desert kit fox were observed at a nearby solar project site in 2018 and 2029 approximately 5 miles from the Project Site.

The 2024 Habitat Assessment and Burrow Survey for BUOW, desert kit fox, and American badger (Rincon, 2025b) identified five burrows potentially suitable for BUOW that were observed, mapped, and classified during the field survey (Burrow Nos. 2–6 in Figure 8). No other burrows were observed other than small mammal burrows too small to be used by the target species. All of the classified burrows were inactive and not occupied. One had old whitewash indicating past use by BUOW (Burrow 3 in Figure 8). The burrow was old and collapsed. No pellets, bones, feathers, other animal scat, or other sign of recent BUOW presence were observed. A second burrow (Burrow No. 6 in Figure 8) displayed characteristic size and shape for a desert tortoise. The burrow was partially collapsed and no animal scat or other sign was observed around the burrow. The remaining three of the five burrows classified (Burrow Nos. 2, 4, and 5 in Figure 8) were determined to be from small mammals and showed no sign of BUOW, desert kit fox, or American badger. This study concluded that the Site did not show evidence of current occupation by BUOW, desert kit fox, or American badger.

The 2025 BUOW study provides a detailed habit description and characterizes vegetation community on and adjacent to the Site as dominantly mature, tall, creosote bush scrub alliance with sporadic western Joshua trees and high levels of anthropogenic disturbance including trash and debris, grazing, and established roads and trails. The creosote bush scrub is dominated by creosote, commonly 8 to 10 feet tall. No BUOWs were observed during Survey 1 but three suitable burrows were identified: (1) a burrow with whitewash that was previously documented in 2024 in the northeast portion of the Site (Burrow No. 3 in Figure 8); (2) a burrow with whitewash located off Site between the Site and the Whirlwind Substation (Burrow 8 in Figure 8); and (3) a potentially suitable burrow with no BUOW sign approximately 250 feet outside the Project Site to the northwest (Burrow 7 in Figure 8). All three burrows were partially collapsed and two were overgrown with vegetation. No BUOW individuals, new suitable burrows, or new BUOW sign was observed during Surveys 2, 3, and 4. During Survey 4, the previously documented burrow located off Site between the Site and the Whirlwind substation (Burrow No. 8) was found collapsed. The 2025 BUOW study documented multiple observations of BUOW predators and predatory sign during all four surveys. Common ravens were observed during every survey day, a prairie falcon (*Falco mexicanus*) was observed once, and red-tailed hawks (*Buteo jamaicensis*) were observed three times. Predator sign observed included the three suitable burrows identified during Survey 1, all being old canid digs, and coyote (*Canis latrans*) scat was observed throughout the survey areas. An active raven's nest was observed in a transmission structure adjacent to the Site in the Survey 1 buffer area, and an active great horned owl (*Bubo virginianus*) nest was observed in a transmission structure approximately 260 feet outside the survey buffer boundary. The numerous lattice transmission structures in the area provide ample opportunity for nesting by predators. The 2025 study concluded that BUOW was not present in or occupying the Site, tie line areas, or adjacent 500-foot buffer areas during the 2025 breeding season.

The habitat assessment resulted in a determination that the Site and adjacent 500-foot buffer is of low habitat suitability for BUOW. This is reflected in the habitat composition of tall shrub cover being counter to the open with short vegetation habitat that BUOW prefers, the high number of observed predators and predator sign, the limited number of suitable burrows, and the absence of BUOW observations or recent BUOW sign. While none of the studies conducted for the Project have identified BUOW or sign of recent BUOW occupation on the Project Site or tie-lines or surrounding 500 foot survey buffers, the 2024 Biological Resources Assessment documented observation of a BUOW approximately 0.75 mile south of the Project Site flying west across 170th Street West (TRC, 2024a).

3.5 Mojave Desert Tortoise

Two Mojave Desert tortoise surveys have been conducted for the Project following USFWS protocol, one in 2024 and one in 2025. The findings of both surveys are described below.

The 2024 Mojave Desert Tortoise study (Rincon, 2025a) provides a detailed habit description characterizing the vegetation as dominantly Creosote Bush Scrub community with some cheesebush-sweetbush, and disturbances from past land uses including grazing, off road vehicle, and other recreation. The desktop study identified three documented desert tortoise records in a 9-quad CNDDB search. The closest record is old, dating from 2010 when several Class 2 burrows (definitely tortoise, good condition) and Class 3 burrows (definitely tortoise; deteriorated, including collapsed) were observed approximately 1 mile north of the Site. The other two records are older tortoise sightings from 2006, and located 10 and 13 miles northeast, respectively. No desert tortoises and no signs of tortoise presence (e.g., tracks, scat) were observed during the 2024 focused survey. One Class 3 burrow (Burrow No. 6 in Figure 8) was identified near the southwest edge of the Site. Additionally, four Class 5 burrows (possibly desert tortoise; deteriorated, including collapsed) were identified (Burrow Nos. 2, 4, 5, and 6 in Figure 8). The 2024 study concludes that the Class 3 burrow demonstrates habitat on the Site is suitable for desert tortoise but the absence of recent desert tortoise or burrows suggests tortoises are not currently present.

The 2025 Mojave Desert Tortoise study (Aardvark Biological Services, 2025a) provides a detailed habit description and characterizes vegetation community on and adjacent to the Site as mature Creosote Bush Scrub alliance with sporadic western Joshua trees and high levels of anthropogenic disturbance including trash and debris, historical sheep grazing, and established roads and trails. The desktop review included previous Project studies and CNDDB occurrences within 5 miles. CNDDB records include May 2010 observations of five Class 2 burrows, two Class 3 burrows, and one Class 4 burrow (possibly tortoise, good condition) within 0.7 to 0.95 mile northeast of the Site. Findings of the 2025 field survey were consistent with the 2024 survey. No desert tortoise individuals were observed. No desert tortoise individuals or sign, including burrows, scat, carcasses, or other, were observed. Four cover sites of appropriate size for an adult desert tortoise, but none of which were desert tortoise burrows, were observed within the Site and adjacent buffers. These cover sites were small mammal dens or digs of desert kit fox, coyote, or badger. No caves or other shelter sites were observed. The previously reported Class 3 burrow from 2024 (Burrow No. 6 in Figure 8) was not found. Common ravens, a tortoise predator, were observed roosting, flying, and nesting on the Site and survey buffer areas. This study concludes that, based on protocol surveys, literature review, and habitat conditions, desert tortoises are not likely to be present on the Project Site and that, while the Site has a few indicators of moderate desert tortoise suitability, there are also multiple strong indicators of low tortoise suitability. Plant communities on the Site are adequate to provide forage and there are suitable substrates for burrow construction. However, the high levels of anthropogenic disturbance, the absence of shelters and caves, the few small mammal dens and digs available for adult tortoises to modify for burrows, and the predator population, are strong indicators of the habitat degradation and overall low suitability of the surveyed areas for desert tortoise.

3.6 Swainson's Hawk

Two focused surveys for SWHA have been completed for the Project: a nesting habitat assessment of the area within 1 mile of the Project Site in 2024 and a nesting survey following

CDFW protocol for the area within 5 miles of the Project Site in 2025. Findings of both are described below.

The 2024 nesting habitat assessment record search identified 21 SWHA observations in a 9-quadrangle CNDDB search, with most being 8 to 12 miles east of the Site near agricultural fields, with nests noted as occurring in introduced ornamental tree species and a few nests in native trees, including Joshua trees. Of the 21 records, only two observations were within 5 miles of the Site; one is a nest active from 2016 to 2020 approximately 2 miles southeast of the Site and the second is a nest active in 2021 approximately 4.5 miles to the northeast. The 2024 study report characterizes vegetation on and adjacent to the Site as dominantly Creosote Bush Scrub community with pockets of cheesbush-sweetbush scrub and disturbances from past land uses including grazing, off-road vehicle, other recreation, and electrical infrastructure. Joshua trees were identified present on the Site and surrounding area but none observed south of Rosamond Boulevard in the Site vicinity. The 2025 study identified habitats within the 1-mile radius of the Site to include Joshua tree woodland and California juniper woodland at higher elevations to the north and west, shadscale scrub at lower elevations to the southeast, and developed land and agriculture to the south (Figure 9). California Juniper woodland is confined to the mountainous terrain at the west and northwest perimeters of the 1-mile study area buffer around the Site. Joshua trees and California juniper trees (*Juniperus californica*) in the study area provide potential SWHA nesting habitat but no SWHA individual or active SWHA nest was observed . No active raptor nest of any kind was observed in any Joshua tree or other tree in the study area. Three active nests of common raven (*Corvus corax*) were observed in the study area and one additional inactive large nest was observed in the study area identified as a raven or raptor nest. One hawk was observed in the study area but distance prevented species identification. Habitat and wildlife observations from the study are included in Figures 7 and 8.

The 2025 study record search identified the same 2016–2020 and 2021 records approximately 2.0 miles southeast and 4.3 miles northeast of the Site, respectively, as described in the 2024 survey. The 2025 field survey for Period I identified Joshua tree woodlands, creosote bush scrub with sparce Joshua trees, and non-native single or hedgerows of trees(s) as potential nesting habitats within the 5-mile buffer. The creosote bush in the Site vicinity is mature and commonly 8 to 10 feet tall. The sporadic Joshua trees on Site are potential nesting habitat for SWHA. Electric transmission structures in the area were also identified as potential nesting sites, though known to be rarely used by SWHA. During protocol survey Periods II and IV, there were observations of adults within the 5-mile buffer but no nests or breeding behavior were observed on the Site or in the 5-mile buffer. During protocol survey Period II, SWHA adults were observed in the buffer in two general areas 4.2 miles south of the Site near a Joshua tree woodland, and 2.0 miles southeast of the Site near a hedgerow of Chinese elms (*Ulmus parvifolia*) adjacent to agricultural fields and in the same region as the 2016–2020 record. During Survey Period IV, two adult SWHA were observed in this same area. Leg bands were observed on at least one individual but were only partially readable. While the survey did not observe any SWHA nests or nesting behavior on the Site or in the 5-mile buffer area, during survey Period IV, two adult SWHA and one nest with one chick were observed approximately 5.5 miles southwest of the Project. The 2025 SWHA survey report concludes that SWHA nesting habitat is present on the Site and surrounding lands, but SWHA was not nesting on the Site or in the 5-mile buffer in 2025. This study characterized habitat on and adjacent to the Site as not high quality for SWHA foraging due to the mature tall creosote bush shrubs and lack of common SWHA prey species.

3.7 Western Joshua Tree

The 2024 Western Joshua Tree Census recorded 419 Joshua trees present on or within 50 feet of the approximately 120-acre Project Site. Rincon reported (Rincon, 2025c) that there were no Joshua trees observed south of Rosamond Boulevard in the Site vicinity, and the 2026 Western Joshua Tree Survey for the tie-lines (Jennings Environmental, 2026) confirmed there were no western Joshua tree along the tie-line routes. Trees documented within the Project Site or 50-foot survey buffer are summarized by size class in Table 3-2, below. Tree locations are shown in Figure 10.

TABLE 3-2
2023, 2024, AND 2025 BIOLOGICAL STUDIES

TREE SIZE CLASS	TOTAL IN STUDY AREA
5m or Greater	33
Greater than 1m less than 5m	249
Under 1m	137
TOTAL	**419**

Three hundred and sixteen of the trees are in the planned Project disturbance footprint and will be removed, with some relocated. An additional 46 trees occur within 50 feet of the planned Project disturbance footprint where CDFW considers that the trees could potentially be indirectly impacted by Project disturbances, depending on tree size. CDFW minimization and mitigation requirements will apply to tree removal under either the WJTCA or the California Endangered Species Act. Under the WJTCA, CDFW will determine the total number of trees impacted according to size class and the number of trees in each size class to be relocated. CDFW will require an approved Western Joshua Tree Relocation plan specifying trees to be relocated, relocation procedures, receiving locations, and monitoring measures.

3.8 Jurisdictional Aquatic Features

The mapping of jurisdictional aquatic features encompassed the Project Site, the tie-line corridors, and two 100-foot-wide corridors that were initially being considered for an access option but are no longer part of the Project lands. Eight unnamed ephemeral drainages were identified and delineated. The drainages are generally ephemeral depositional channels with sandy bottoms, low sandy banks, and vegetation consistent with the upland surroundings. Typical bed and bank conditions are evident in photographs appended to the jurisdictional delineation report in Appendix A. These drainages only convey surface flow in direct response to precipitation and do not support riparian vegetation. They are not relatively permanent, standing, or continuously flowing bodies of water and, therefore, will not qualify as Waters of the United States. However, they do meet criteria making them qualify as WOS and streambeds subject to the jurisdiction of RWQCB and CDFW, respectively. Areas determined to be jurisdictional are shown in Figures 11 and 12 and summarized in Table 3-3. Approximately 2.80 acre of CDFW jurisdictional streambed and 0.12 acre of WOS are within areas planned for development onsite and will be impacted by grading for Project construction. In addition, the offsite tie-lines could impact up to 0.75 acre of CDFW jurisdictional streambed and up to 0.74 acre of WOS if SCE determines during final tie-line design that up to the full 100-foot wide tie-line corridors will be disturbed.

TABLE 3-3
JURISDICTIONAL FEATURES IN THE SURVEY AREA

EPHEMERAL CHANNEL NO.	BANK-FULL MAX. WIDTH (FEET)	MAX. CHANNEL DEPTH (INCHES)	LENGTH IN SURVEY AREA (FEET)	WOS ACRES	CDFW JURISDICTION STREAMBED
1	22	6	1,194	0.11	2.53
2	11	4	301	0.02	0.13
3	21	4	613	0.04	0.15
4	395	2	280	0.71	1.19
5	8	1	127	0.03	0.03
6	4	1	337	0.07	0.08
7	2	2	313	0.05	0.05
8	25	6	102	0.03	0.03
TOTAL				**1.06**	**4.19**

CDFW's jurisdiction often extends well beyond the Ordinary High Water Mark (OHWM) defining WOS. For the Project Site, the greatest difference occurs at Drainage Feature 1 where the sheet flow has occasionally escaped the limits of the low flow channel. This creates what is classified a Paleo or Historical Channel. A Paleo Channel is not considered jurisdictional under WOS but is considered jurisdictional under Fish and Game Code.

Not all of the survey area will be disturbed. The areas comprising WOS and jurisdictional streambed that occur within areas planned for disturbance by the Project are summarized in Table 3-4.

TABLE 3-4
ANTICIPATED JURISDICTIONAL WATERS AND STREAMBED IMPACTS

PROJECT FEATURE	WOS IMPACT (AC)	STREAMBED IMPACT (AC)
On-Site disturbance footprint	0.12	2.80
East Tie-Line	0.35	0.36
West Tie-Line	0.45	0.45
East and West Tie-Line Overlap	-0.06	-0.06
TOTAL	**0.86**	**3.55**

3.9 Summary of Findings

Figures 7 and 8 summarize special status wildlife sightings and sign identified by Project surveys, and Figures 9 and 10 summarize vegetation and landcover data. CDFW jurisdictional streambeds are shown in Figure 11 and WOS are shown in Figure 12. Photographic logs from surveys are included in Appendix A. A compendium of all species documented based on observations or sign is included in Appendix B. A compendium of species identified to potentially occur in the region, their current protection status, and the probability of occurrence is provided in Appendix C.

Desktop research and field surveys from the studies summarized in this report provide detailed habitat, plant, and wildlife information for the Site, tie-line routes, and adjacent areas outward up to 5 miles. Key findings are presented below:

- The vegetation on the Site, tie-line alignments, and 500-foot buffers are dominantly mature creosote bush scrub alliance with sporadic western Joshua trees and high levels of anthropogenic disturbance, including trash and debris, historical grazing impacts, and established roads and trails. The creosote bush scrub on the Site and adjacent areas is dominated by creosote bush scrub commonly 8 to 10 feet tall.
- Three hundred and sixteen western Joshua trees are in the planned Project disturbance footprint and will be removed, with some relocated. An additional 46 trees occur within 50 feet of the planned Project disturbance footprint where CDFW considers that the trees could potentially be indirectly impacted by Project disturbances, depending on tree size. CDFW minimization and mitigation requirements will apply under either the WJTCA or the California Endangered Species Act. Under the WJTCA, CDFW will determine the total number of trees impacted according to size class and the number of trees in each size class to be relocated. Western Joshua tree removals will require authorization from CDFW through either the WJTCA or an Incidental Take Permit.
- Based on two focused rare plant surveys, Threatened, Endangered, or Rare plant species are unlikely to occur on the Site, the tie-line routes, or survey buffer areas. Two species that were identified to have a moderate potential to occur, but not observed during the 2024 rare plant studies, were again not observed in 2025 and determined unlikely to be present by the 2025 rare plant study.
- Other than the western Joshua tree, a Candidate for State listing and protected under the CDNPA, the only protected plant species identified in the proposed development footprint is the silver cholla, protected under the CDNPA. Plants protected under the CDNPA require landowner notification to CDFW before removal. One silver cholla was documented in the proposed development area and one additional individual was documented adjacent to the Site outside the planned disturbance footprint.
- Based on absence of individuals or recent signs, desert tortoise is presumed absent on the Site, tie-line routes, and adjacent buffers.
- Neither BUOW or recent BUOW sign has been observed on the Site or tie-line routes or survey area buffers, but whitewash at two partially collapsed burrows identified on and adjacent to the Site provides evidence of past use by BUOW and suitability of the habitat for BUOW. The BUOW habitat suitability is low on the Site, in the proposed tie-line alignments, and the adjacent 500-foot buffer. This is based on the tall vegetation being counter to the open with short vegetation habitat that BUOW prefers, a high number of observed predators and predator sign, a limited number of suitable burrows, and the absence of BUOW observations or recent BUOW sign.
- SWHA was not nesting on the Site or in the 5-mile buffer in 2025. The Site and adjacent lands provide lower quality SWHA foraging habitat than occurs in surrounding areas farther away in the 5-mile buffer due to the mature tall creosote bush shrubs and lack of common SWHA prey species.
- No desert kit fox nor American badger, nor sign thereof, were identified on or adjacent to the Project Site or tie-lines in a 2024 focused habitat assessment and burrow survey.

- Approximately 3.55 acres of CDFW-jurisdictional streambed and 0.86 acre of WOS occur in the proposed development footprint including both onsite and the offsite tie-line corridors.

4.0 Biological Resource Conservation Measures

4.1 Project Measures

The Project Description submitted for the Project's conditional use permit incorporates the following biological resource conservation measures:

- The disturbance footprint will be minimized to the extent practical for safe and efficient construction and operations. The limits of disturbance will be clearly marked with flagging or fencing to avoid disturbance outside the permitted area.
- Joshua trees that can be avoided, such as trees adjacent to limits of disturbance or in the temporary staging area, will be fenced during construction with a setback distance to prevent impact on roots. Project access driveways and other features have been designed to avoid impacting trees where practical.
- On-Site construction workers will be required to have training under a Workers Environmental Awareness Program, which will include best management practices for natural resource protection, laws, project rules and guidance for resource protection, and instruction for identifying and responding to applicable project requirements.
- A trash abatement program will be implemented for construction and the duration of the Project. The program will include wildlife-resistant trash receptacles maintained closed when not in use, employee awareness training, periodic policy reinforcement, and control of windblown or other litter to avoid attraction of predators.
- Pre-construction surveys for BUOWs will be conducted by a qualified biologist in two phases: one survey within 14 days prior to construction initiation and one survey within 24 hours before ground disturbance begins. Surveys will cover all suitable habitat within 150 meters of the construction area and be phased with the construction schedule such that surveys occur no more than 14 days ahead of ground disturbance in new areas. Alternatively, if an Incidental Take Permit for BUOW is obtained with different pre-construction survey requirements, the requirements of the Incidental Take Permit will be followed.
- Pre-construction surveys will include surveys for active nests if construction will begin during a nesting season.
- Construction will be set back from active nests if present during construction.
- Biological resource monitoring will occur during construction under the direction of a Designated Biologist approved by CDFW.
- If BUOW is encountered, response actions will be dictated by an Incidental Take Permit will be followed.
- Biological resource monitoring will occur during construction.

- Impacts on western Joshua tree will be mitigated through the WJTCA or through habitat compensation under an Incidental Take Permit. Western Joshua tree removals will require authorization from CDFW through either the WJTCA or an Incidental Take Permit and minimization and mitigation requirements that will apply under either regulatory program will be adhered to. Under the WJTCA, CDFW would determine the total number of trees impacted directly or indirectly according to size class, and the number of removed trees in each size class to be relocated. CDFW will require an approved Western Joshua Tree Relocation plan specifying trees to be relocated, relocation procedures, receiving locations, and monitoring measures.
- Impacts on WOS and jurisdictional streambeds and mitigation will be provided in accordance with agency requirements. The Project Proponents propose to arrange for mitigation prior disturbance to WOS or jurisdictional streambeds using credits from a conservation bank such as Butte Valley Conservation Bank, West Harper Conservation Bank, WildWest Mojave Desert Conservation Bank, or another conservation bank acceptable to CDFW and RWQCB to provide for jurisdictional stream area equal or better in water quality and habitat value to the impacted area.
- A 15 mile-per-hour speed limit will be enforced on Site.

4.2 CDFW Coordination and Permitting

The Project Proponents have been coordinating with CDFW and intend to pursue authorization for removal and mitigation for Joshua trees through an Incidental Take Permit or under the WJTCA. In addition, the Project Proponents intend to pursue an Incidental Take Permit from CDFW for BUOW as long as BUOW remains a Candidate species or is determined to be Threatened or Endangered.

In addition to a pre-construction site clearance survey, based on discussions with CDFW staff on May 5 and June 3, 2025, species for the following additional species are planned:

- An additional SWHA nesting survey in 2026.
- Crotch’s bumble bee (*Bombus crotchii*) habitat assessment and survey in 2026.

Crotch’s bumble bee was not addressed in prior studies for the project so potential for presence has not been ruled out. Crotch's bumble bee is a native, colonial bee endemic to California and Baja California, Mexico, that has experienced substantial range contractions and population declines relative to historical records (Hatfield et al. 2018; USFWS, 2025). Like all bumble bees, it is highly social, living in colonies with a reproductive queen, non-reproductive female workers, and seasonal males, each fulfilling distinct roles within the colony (Williams et al. 2014). Colony initiation occurs in early spring when overwintered queens emerge and establish nests, typically in subterranean cavities such as abandoned rodent burrows (Williams et al. 2014; Thorp, 1983). Workers are produced progressively through the summer months, with reproductive males and new queens reared later in the season. Following mating, newly fertilized queens seek protected overwintering sites as the colony declines (Williams et al. 2014). Crotch’s bumble bee is most strongly associated with open, low-elevation habitats within California's interior, including annual grasslands, desert scrub, chaparral-scrub transition zones, and native wildflower fields (Hatfield et al. 2015; CDFW, 2026b). Historically, the species occurred at greater densities throughout the San Joaquin Valley, the western Mojave Desert, and

surrounding foothills; however, current occurrences are considerably reduced in both range and abundance relative to historical documentation (Hatfield et al. 2018; USFWS, 2025).

Crotch's bumble bee is a generalist forager, utilizing a broad range of native flowering plant species as pollen and nectar resources (Williams et al. 2014; Xerces Society, 2019). The species has demonstrated foraging associations with plants across numerous families, with documented preferences for members of the sunflower (*Asteraceae)*, legume (*Fabaceae)*, mint (*Lamiaceae)*, evening primrose (*Onagraceae)*, and buckwheat (*Polygonaceae)* families (Thorp, 1983; Williams et al., 2014). Key forage plant genera include wild buckwheat (*Polygonaceae* e*riogonum)*, sages (*Salvia officinalis*), California poppy (E*schscholzia californica*), *Phacelia*, and bladderpod (*Peritoma arborea*) (Xerces Society, 2019). Regional Bumble Bee Atlas records near the Project Site document these associations, including a documented observation of a large queen (Crotch's bumble bee) foraging on bladderpod along Gorman Post Road on May 27, 2025, and a separate record of a female foraging on lacy *phacelia* (*Phacelia tanacetifolia)* near California City on September 30, 2024 (Bumble Bee Atlas, 2025). These records indicate that the species actively utilizes native forbs characteristic of Mojave Desert-edge and western Antelope Valley habitats within the broader project region (Bumble Bee Atlas, 2025; Xerces Society, 2019).

Based on a review of available occurrence data and Site conditions, Crotch's bumble bee has a low to moderate potential to occur in the Project Site. The on-Site vegetation community consists of mature creosote bush scrub with scattered Joshua trees, which represents somewhat marginal habitat relative to the more productive annual grassland and mixed scrub communities most associated with the species (Hatfield et al. 2015; USFWS, 2025). However, the Site supports a diverse native forb assemblage that includes documented forage species such as multiple buckwheats (*Eriogonum*), California poppy, California goldfields (*Lasthenia californica)*, thistle sage (*Salvia carduacea*), cjoa (*Salvia columbariae*), and purple owl's clover (*Castilleja exserta*), all of which establish suitable foraging resources within the Project Site (Thorp, 1983; Williams et al., 2014). A review of iNaturalist within the Project vicinity yielded no detections of Crotch's bumble bee with only yellow-faced bumble bee (*Bombus vosnesenskii*) and Van Dyke's bumble bee (*Bombus vandykei*) recorded in the area (iNaturalist, 2026). A query of the CNDDB and review of the CDFW Special Animals List confirm the species' documented occurrences within the broader region (CDFW, 2025; CDFW, 2026b). The nearest confirmed Crotch's bumble bee record was documented approximately 25 miles west-southwest of the Project Site via the Bumble Bee Atlas on May 27, 2025, confirming the species' continued presence within the broader regional landscape (Bumble Bee Atlas 2025). Given the availability of on-Site foraging resources and documented regional occurrences, the Project may have the potential to support transient use by foraging individuals, particularly queens during the spring flight period. The habitat assessment and survey planned in 2026 will provide a more complete assessment of habitat suitability and potential for species occurrence in the Project Site.

5.0 California Environmental Quality Act Considerations

a. Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by CDFW or USFWS?

   No candidate, sensitive, or special status species or sign of recent occupation by any candidate, sensitive or special status species has been observed on or adjacent to the Project Site except for Loggerhead shrike, a Species of Special Concern that has been

observed perching in vegetation nearby, and western Joshua tree, a candidate species. Based on preliminary planning, the Project will directly impact approximately 105.6 acres of creosote bush scrub and cheesebush-sweetbush scrub on Site, and 316 Joshua trees. An additional 46 trees occur within 50 feet of the planned Project disturbance footprint where CDFW considers that the trees could potentially be indirectly impacted by Project disturbances, depending on tree size. The final indirect impacted tree count will be determined by CDFW and subject to authorization from CDFW and CDFW minimization and mitigation requirements under the WJTCA or the California Endangered Species Act. CDFW will determine the total number of trees impacted according to size class and the number of trees in each size class to be relocated. BUOW, a Candidate species, has inhabited the Project Site in the past demonstrating that the Project Site provides potentially suitable habitat for this species, but the habitat has been assessed as low due to vegetation conditions, limited suitable burrows, and predator populations. Development of the Site will impact BUOW and Loggerhead shrike foraging habitat directly through clearing and grading and indirectly in adjacent areas through noise, night lighting, and human presence. Pre-construction nesting surveys will be conducted and any active nests will be avoided to prevent direct impacts on individuals, if present.

While no BUOW or sign of recent occupation of BUOW has been observed on or adjacent to the Project Site, as a precaution for BUOW potentially moving onto the Site, the Project Proponents intend to pursue an Incidental Take Permit from CDFW for BUOW and will provide compensatory mitigation for habitat impacts in accordance with CDFW requirements. The Project Proponents will mitigate impacts on Joshua trees through fees established under the WJTCA or through an Incidental Take Permit. Compensatory mitigation will provide equivalent or better BUOW habitat value in comparison to the impact area and Loggerhead shrike can utilize similar habitat to BUOW and have a wider range. Therefore, equivalent or better habitat value in compensatory mitigation will effectively limit the Project impact on BUOW and Loggerhead shrike to a level that would not be substantially adverse.

Based on the results of biological resources studies completed to date including two protocol-level desert tortoise surveys, desert tortoise is presumed absent and no impact on this species is anticipated.

b. Would the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans. policies, regulations or by CDFW or USFWS?

   No riparian habitat or other sensitive natural community occurs on or adjacent to the Project Site (TRC 2023, 2024a, 2024b). The ephemeral drainages that would be impacted by Project development do not support riparian vegetation (TRC, 2024a; Mountainview Biological Consulting, 2025). Therefore, the Project will not impact any riparian habitat or other sensitive natural community.

c. Would the Project have a substantial adverse effect on state or federally protected wetlands through direct removal, filling, hydrological interruption or other means?

   No wetlands or federally jurisdictional waters are present on or adjacent to the Project (Mountainview Biological Consulting, 2025). Ephemeral drainages on the Project Site that would be impacted by the Project include approximately 2.80 acres of CDFW jurisdictional

streambed and 0.12 acre of WOS that would be impacted long-term by on-Site grading and drainage controls. Under current conditions, these areas merge to a single channel on-Site. These areas would be graded to drain in a rip-rap lined ditch to a stabilized discharge structure that will return water to the same drainage channel where it currently leaves the Site, and stormwater detention and retention ponds are included in the Project's stormwater engineering design to limit stormwater runoff from the Site so that downstream flow depths, velocities, and drainage patterns will be maintained. The off-Site tie-lines could disturb up to 0.75 acre of CDFW jurisdictional streambed and up to 0.74 acre of WOS if SCE determines during final tie-line design that up to the full 100-foot wide tie-line corridors will be disturbed due to access and construction needs. Impacts on stream channels from the tie-line will be short term since access, if needed, would be dirt roads following existing grade, and if trenching is needed for underground infrastructure disturbed areas would be returned to approximate existing grade as part of construction. The Project Proponent will apply for needed authorizations from CDFW and RWQCB and will minimize and mitigate impacts in accordance with their respective requirements including compensatory mitigation preserving equal or better habitat value for BUOW, and streambed area exceeding the Project's impacts to WOS and jurisdictional streambed. Considering the small impact area, absence of riparian, wetland, or other sensitive habitat, and required oversight and mitigation requirements of CDFW and RWQCB, the Project will not have a substantial adverse effect on CDFW or RWQCB jurisdictional waters.

d. Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

   The Project area does not include any fish habitat. Furthermore, the Project Site and adjacent lands do not include any important wildlife movement or migratory corridors. Therefore, the Project will not substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. As described in a), above, the Project Site and adjacent lands provide low quality BUOW habitat so it is possible that BUOW could move onto the Site and nest. For reasons described in a), above, impact on BUOW would not be substantially adverse.

e. Would the Project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

   The Project would not conflict with any local policy or ordinance protecting biological resources. The Project will require permits and California Environmental Quality Act (CEQA) review by the County and Responsible Agencies and no variance from policies or ordinances is anticipated related to biological resources.

f. Would the Project conflict with the provisions of an adopted Habitat Conservation Plan, natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?

   The Project would not conflict with any adopted Habitat Conservation Plan, natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan. There are no such plans applicable to the Project Site.

CEQA also requires evaluation of whether the Project has the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of a rare or endangered plant or animal. No protected or sensitive habitat or movement or migration corridor occurs on or adjacent to the Project Site. The creosote bush scrub vegetation assemblage that occurs on and adjacent to the Site is comment and widespread throughout southeastern California and eastward. There are no sensitive species on the Site with unusually limited habitat constraints. Therefore, the habitat conversion of 105.6 acres on-Site and up to 6.15 acres off-Site will not substantially reduce the habitat or restrict the range of any wildlife species. There is no fish habitat in the Project vicinity. Considering impacts and mitigation described in Section a), above, the Project will not have the potential to substantially cause any wildlife population to drop below self-sustaining levels. Western Joshua tree is the only special status plant species that has been identified on the Site. Mitigation of the Project's Joshua tree impacts under the WJTCA or an Incidental Take Permit will be consistent with State policy for managing the long-term viability of Joshua tree populations. Considering these factors, the Project will not substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of a rare or endangered plant or animal.

CEQA also requires that cumulative impacts of a project be addressed. Numerous past, present, and reasonably foreseeable projects that have or could occur in the region compound or could compound with the habitat conversion that will occur for the Project. Past agriculture and construction of existing projects have impacted wildlife habitat in the region. Existing projects in the area include wind energy developments to the north, solar energy generation and battery energy storage developments to the northeast, east, south and southwest, agriculture to the northeast and southeast, rural residential developments to the east, south, and southwest, and roads, trails, and linear electric and water supply infrastructure developments throughout the region. Past agricultural activity and project developments have converted large areas of natural habitat in the western Antelope Valley. Reasonably foreseeable projects provided by County staff within 7 miles and with potential for cumulative impacts on biological resources include:

- Keyhole Wind Project that abuts and extends northwestward from the Project Site on approximately 3,920 acres of mostly undeveloped natural desert habitats, including areas with creosote bush scrub habitat similar to the Project Site at Keyhole Wind Project's lowest elevations.
- Bullhead Solar Facility located approximately 7 miles northwest of the Project Site. This project could develop approximately 2,000 acres of former agricultural lands and various scrub communities that provide wildlife habitat.
- Rosamond Three Battery Energy Storage Project located approximately 3 miles southeast of the Project Site that could develop approximately 40 acres of previously disturbed lands that provide wildlife habitat.
- Tumbleweed Energy Storage Project located approximately 6 miles southeast of the Project Site. This project footprint is graded and planned future improvements at this Site will not have additional wildlife impacts.

- Conditional Use Permit for Construction and Operation of a Cemetery approximately 5 miles southeast of the Project Site on a 5-acre parcel that was previously cleared of vegetation and is beginning to recolonize providing some wildlife habitat.

Additional development in the region is also foreseeable.

The Project will incrementally add to the loss and degradation of wildlife habitat in the region. While the Project impact on wildlife habitat will not be substantial with proposed mitigation, it will add incrementally to direct and indirect impacts on habitat from other projects that cumulatively are substantial.

6.0 References

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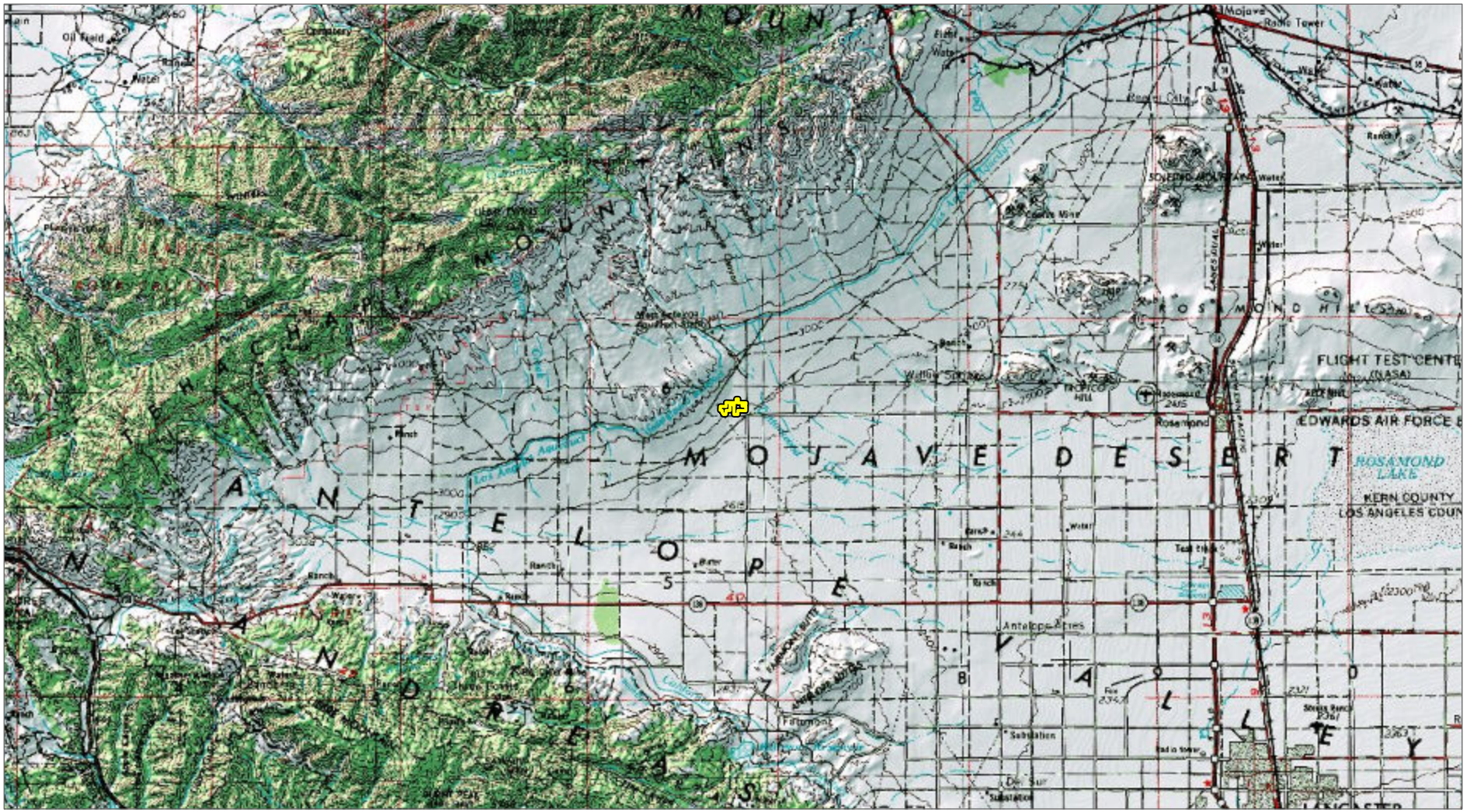
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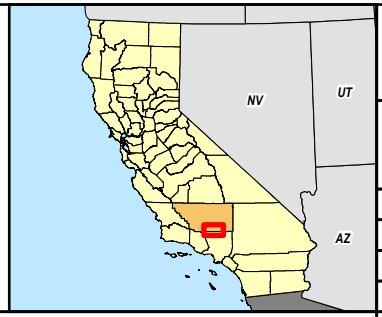
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Figures



LEGEND

PROJECT SITE



BASE MAP: USGS TOPOGRAPHIC SERVICE LAYER
DATA SOURCES: TRC, RINCON, USGS

0 12,500 25,000 FEET

1:300,000 1" = 25,000'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

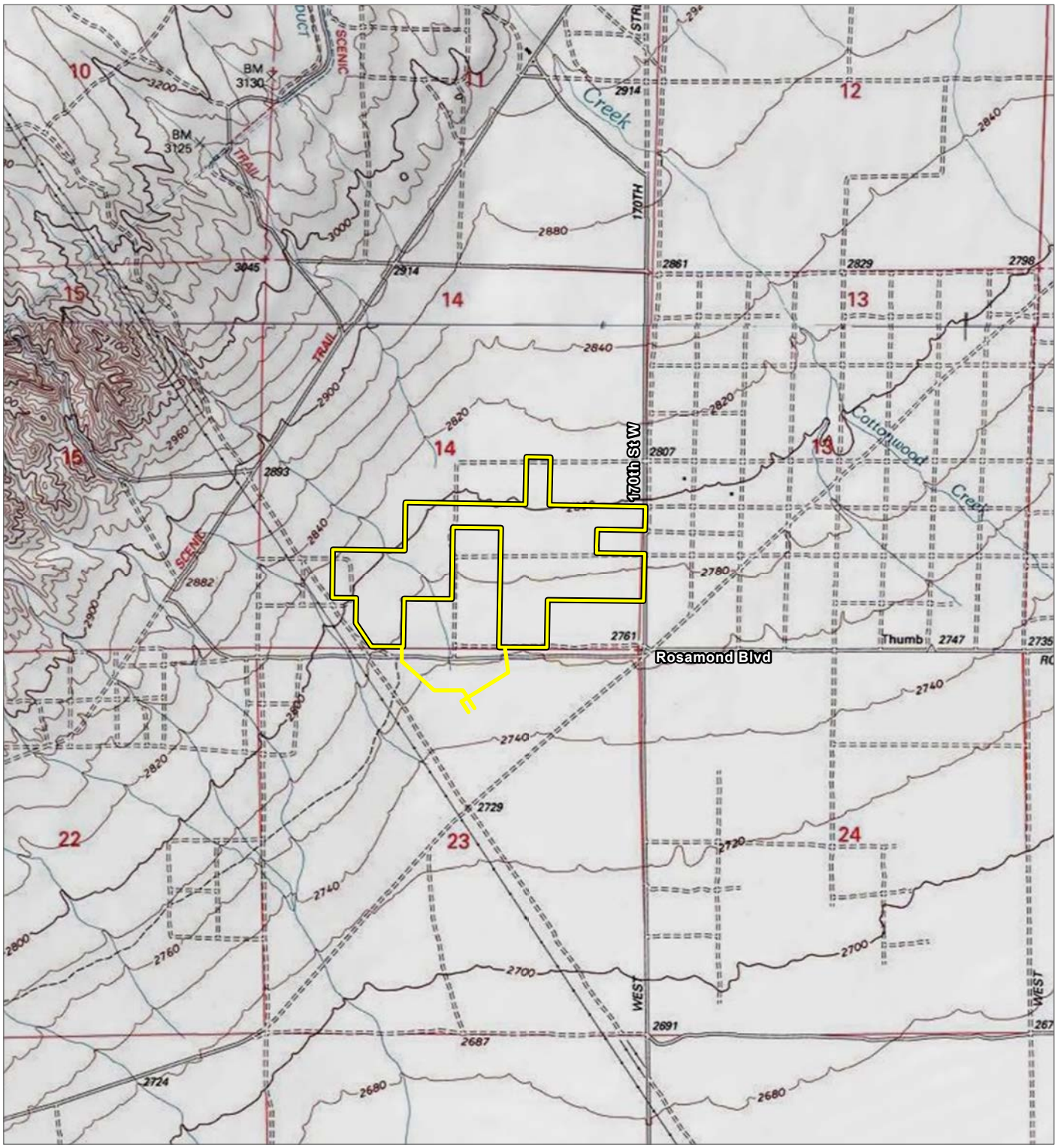
TITLE:
PROJECT VICINITY MAP

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 1**
DATE:	NOVEMBER 2025		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET. MAP ROTATION: 0
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LEGEND

PROJECT SITE

ELECTRIC TIE-LINE

BASE MAP: USGS TOPOGRAPHIC SERVICE LAYER
7.5' QUADRANGLE : FAIRMONT BUTTE (34118-G4)
DATA SOURCES: TRC

N

0 1,000 2,000

FEET

1:24,000 1" = 2,000'



PROJECT:

EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

TITLE:

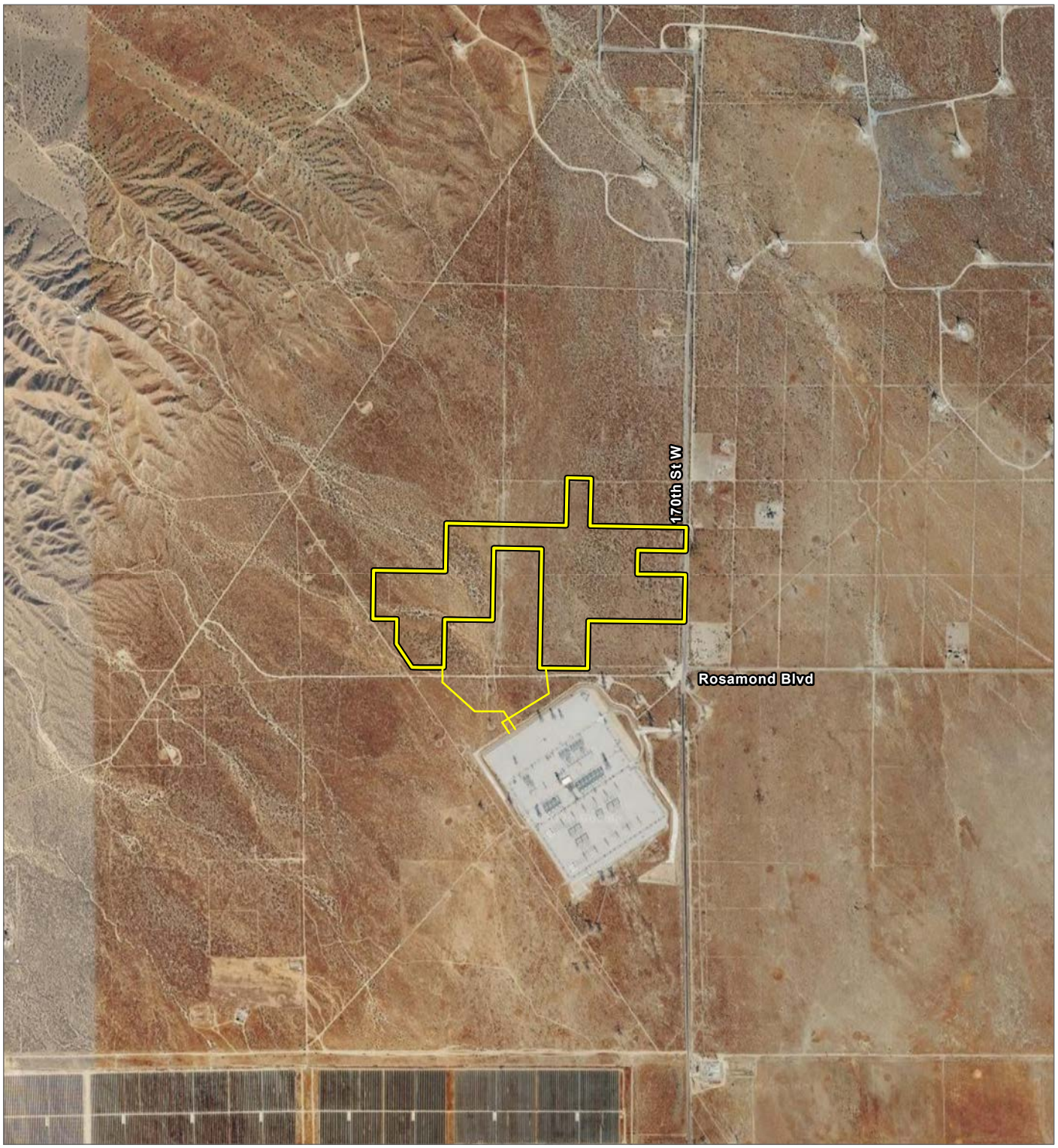
PROJECT LOCATION MAP
TOPOGRAPHIC

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 2**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET: MAP ROTATION: 0
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LEGEND

PROJECT SITE

ELECTRIC TIE-LINE

BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, GOOGLE

N

0 1,000 2,000

FEET

1:24,000 1" = 2,000'



PROJECT:

EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

TITLE:

PROJECT LOCATION MAP
AERIAL

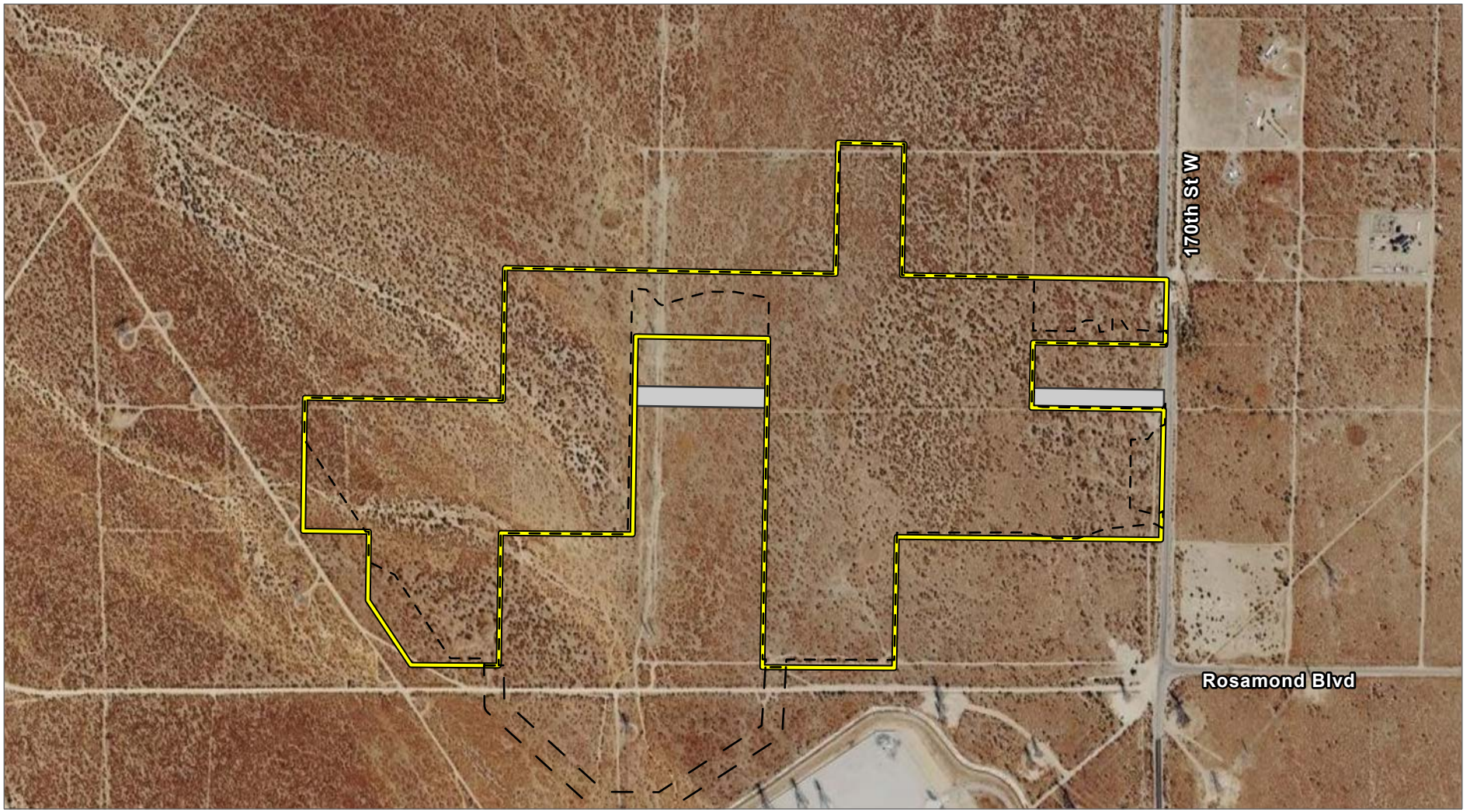
DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 3**
DATE:	APRIL 2026		

TRC

6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

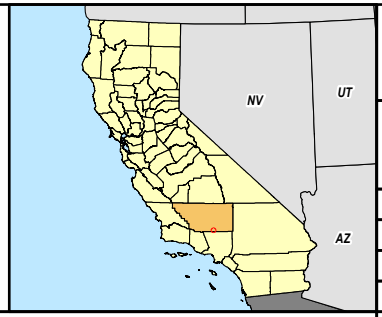
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LEGEND

- PROJECT SITE
- OBSOLETE ACCESS ROAD OPTION
- PRELIMINARY GRADING LIMITS
- TIE-LINE CONSTRUCTION AREA LIMITS



BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, GOOGLE

N

0 375 750 FEET

1:9,000 1" = 750'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

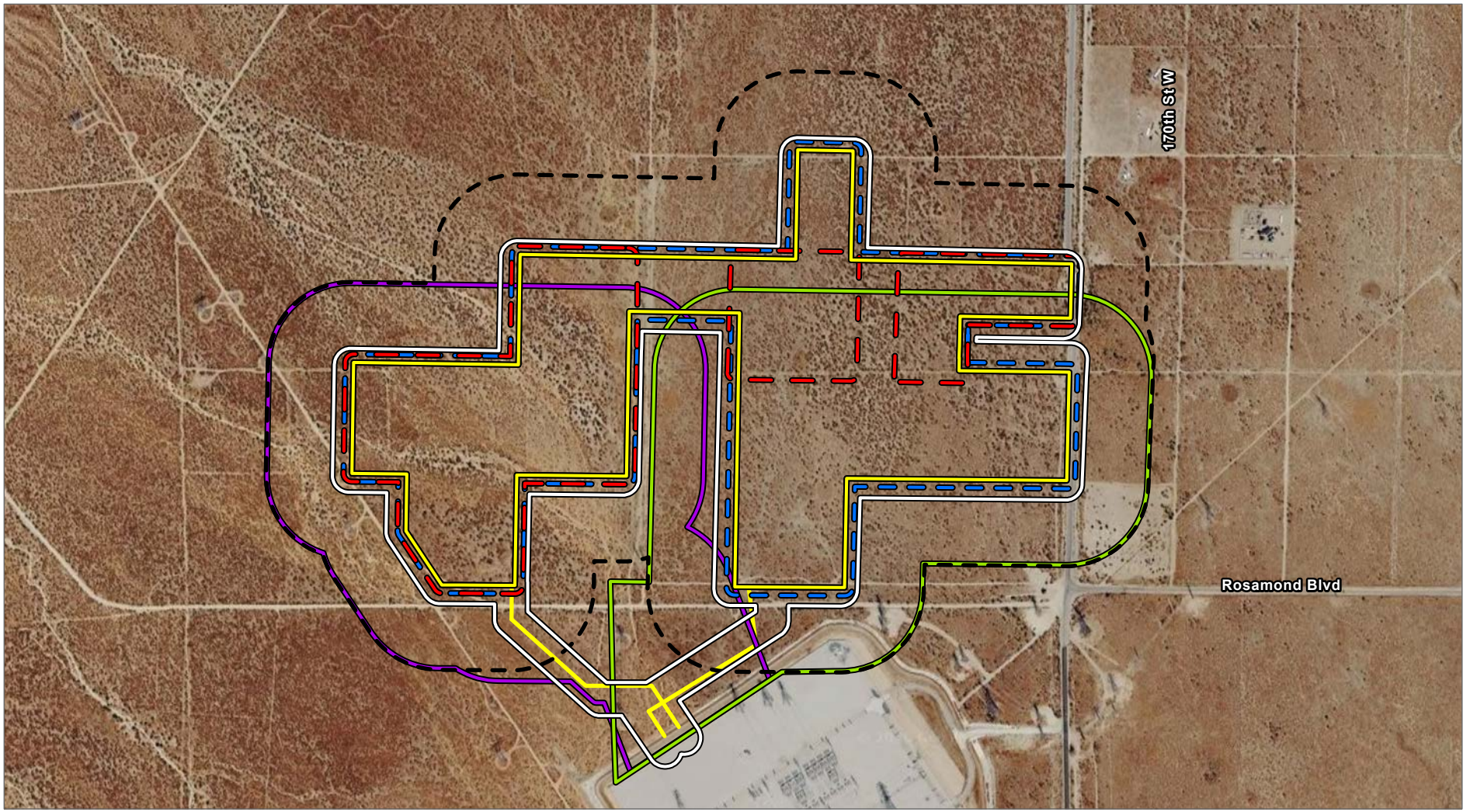
TITLE:
PROJECT SITE BOUNDARY AND OBSOLETE ACCESS ROAD OPTION

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 4**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET. MAP ROTATION: 0
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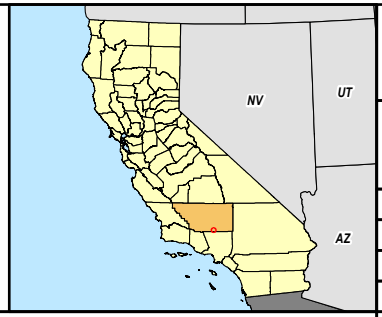


LEGEND

- PROJECT SITE
- ELECTRIC TIE-LINE
- JUNE 2023 BRA
- MARCH 2024 BRA
- 2024 FOCUSED HABITAT ASSESSMENTS

2025 RARE PLANT SURVEY

- 2024 SURVEY #1
- 2024 SURVEY #2
- 2025 SURVEY



NOTES
WESTERN JOSHUA TREE SURVEY BOUNDARY SHOWN SEPARATELY ON FIGURE 10.

BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

0 450 900 FEET
1:10,800 1" = 900'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

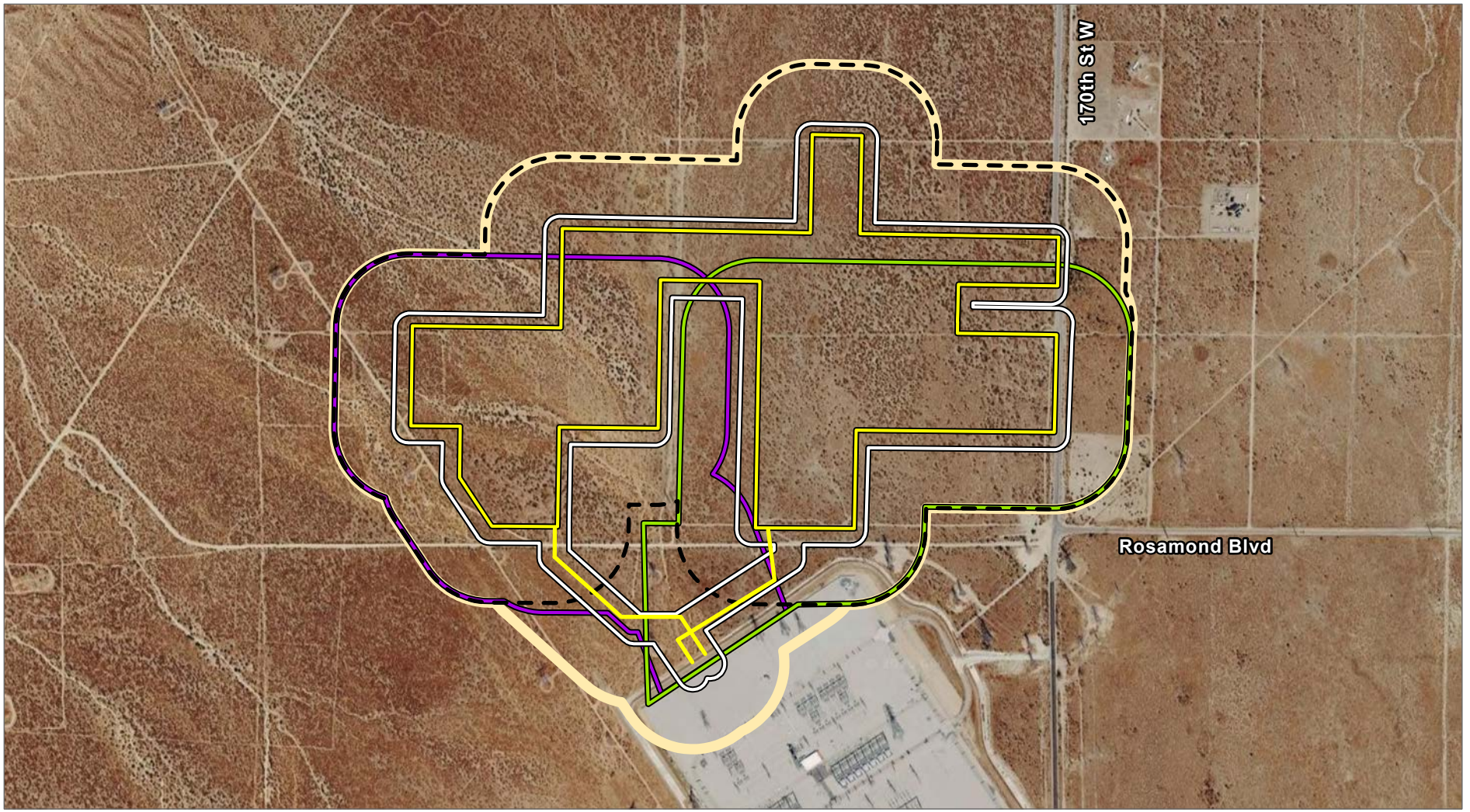
TITLE:
2023, 2024 AND 2025 PLANT RESOURCE STUDIES

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 5**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

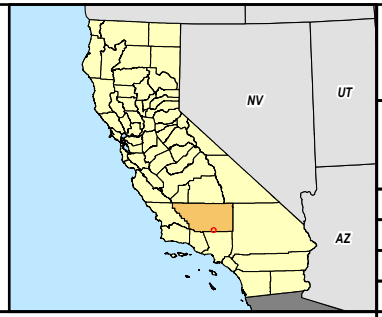
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LEGEND

- PROJECT SITE
- JUNE 2023 BRA
- MARCH 2024 BRA
- 2024 BURROWING OWL, DESERT KIT FOX, AND AMERICAN BADGER SURVEY; 2024 DESERT TORTOISE SURVEY
- 2025 DESERT TORTOISE SURVEY
- 2025 BURROWING OWL SURVEY
- ELECTRIC TIE-LINE



NOTES
2024 AND 2025 SWAINSON'S HAWK SURVEY BOUNDARIES SHOWN SEPARATELY IN FIGURE 7.

BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

0 500 1,000 FEET

1:12,000 1" = 1,000'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

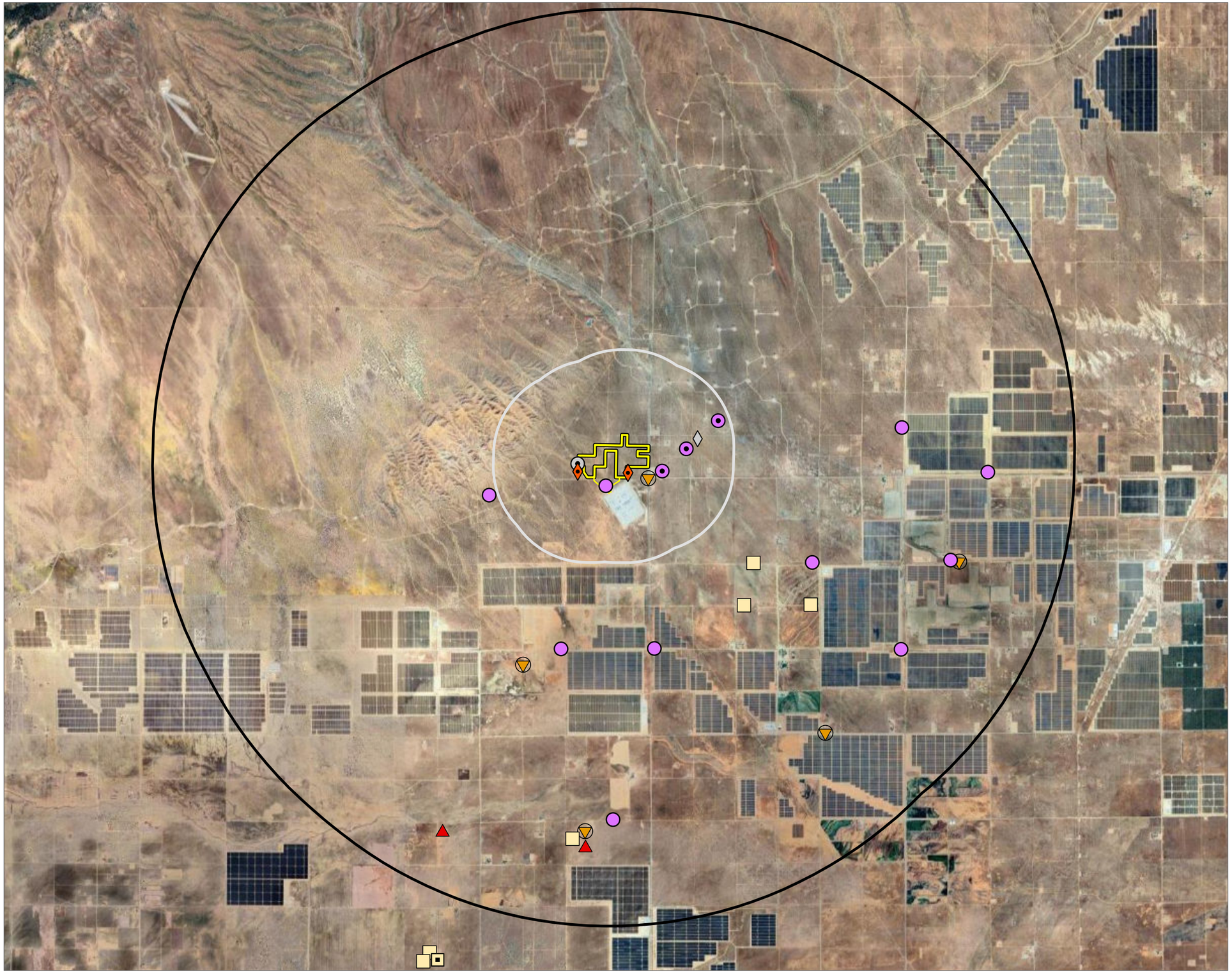
TITLE:
2023, 2024 AND 2025 WILDLIFE STUDIES

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 6**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET. MAP ROTATION: 0
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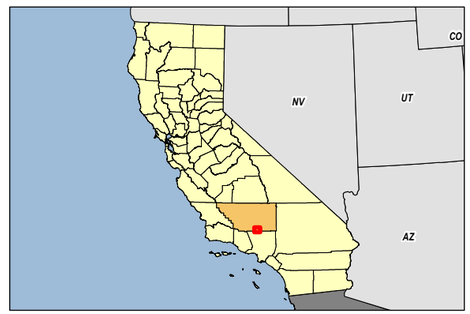


LEGEND

- PROJECT SITE
- ELECTRIC TIE-IN
- 2024 SWHA NESTING HABITAT ASSESSMENT
- 2025 SWHA NEST SURVEYS
- GREAT HORNED OWL
- RED-TAILED HAWK
- SWAINSON'S HAWK, ADULT
- SWAINSON'S HAWK, NEST WITH 1 CHICK
- COMMON RAVEN
- RAVEN NEST
- INACTIVE LARGE NEST
- LIVE HAWK
- LOGGERHEAD SHRIKE

BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

1:72,000
1" = 6,000'
0 3,000 6,000 FEET



PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

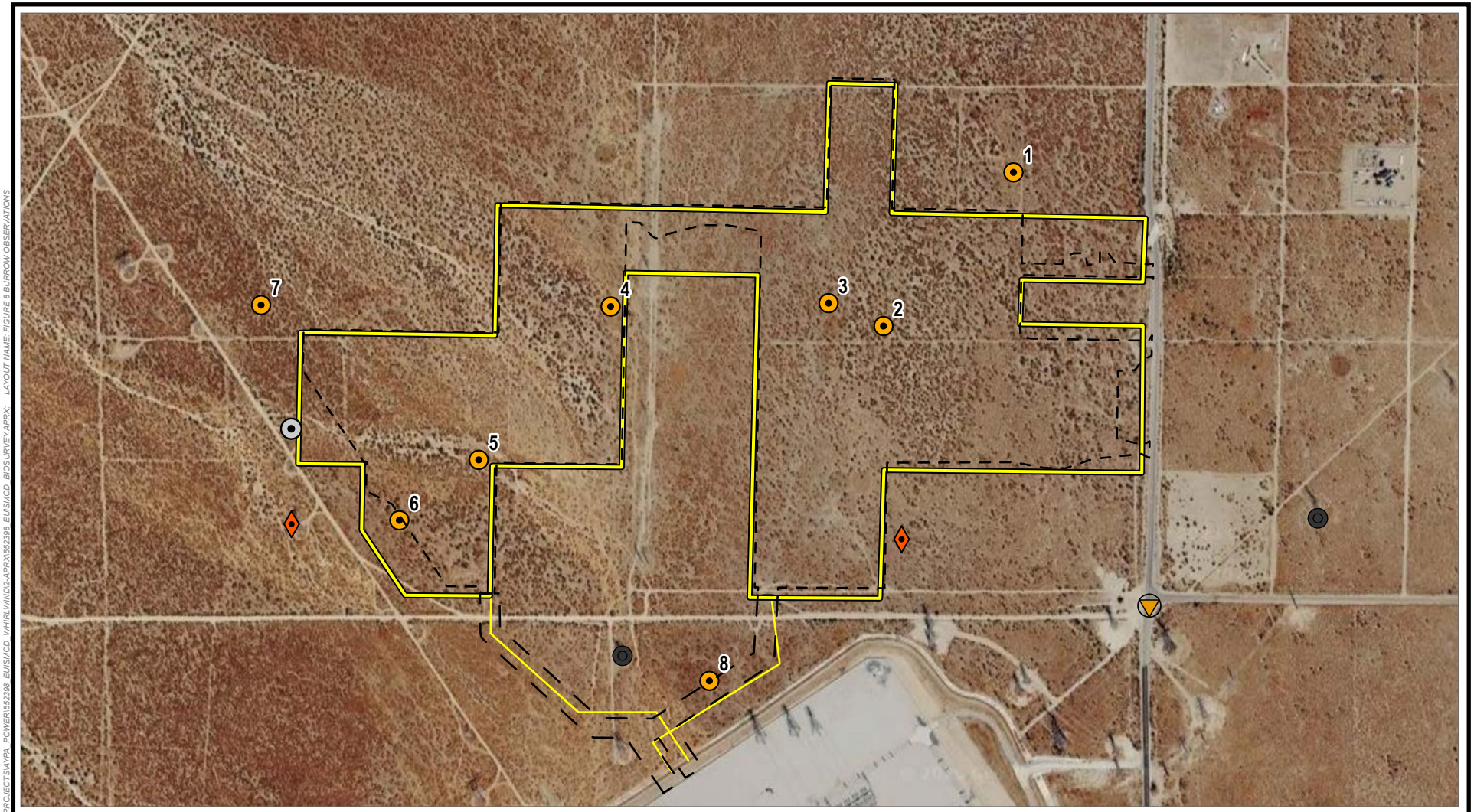
TITLE:
PREDATORY BIRD AND SWHA OBSERVATIONS

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 7**
DATE:	NOVEMBER 2025		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

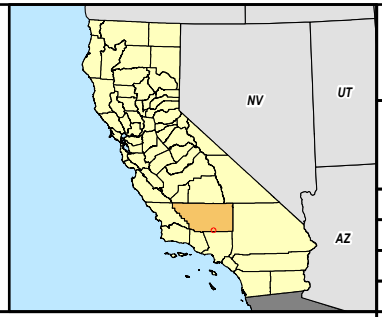
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LEGEND

- PROJECT SITE
- ELECTRIC TIE-LINE
- PRELIMINARY GRADING LIMITS
- TIE-LINE CONSTRUCTION AREA LIMITS
- BURROW (SEE TABLE 3-1)
- RAVEN/ RAVEN NEST
- GREAT HORNED OWL
- LOGGERHEAD SHRIKE
- INACTIVE LARGE NEST



BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

N

0 375 750 FEET

1:9,000 1" = 750'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

TITLE:
BURROW, WILDLIFE, AND SIGN OBSERVATIONS

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 8**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

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LEGEND

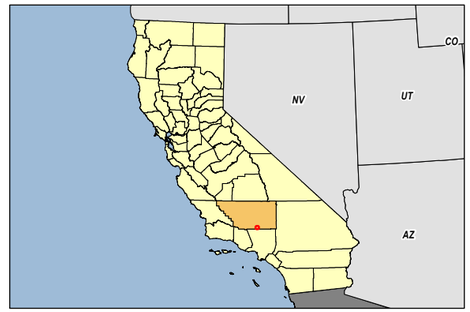
- SILVER CHOLLA
- ELECTRIC TIE-LINE
- ONE MILE BUFFER
- PROJECT SITE

VEGETATION COMMUNITY

- CREOSOTE BUSH SCRUB
- CHEESEBUSH-SWEETBUSH SCRUB
- SHADESCALE SCRUB
- JOSHUA TREE WOODLAND
- CALIFORNIA JUNIPER WOODLAND
- AGRICULTURE
- DEVELOPED

BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

1:16,800
1" = 1,400'
0 700 1,400 FEET



PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

TITLE:
VEGETATION COMMUNITIES

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 9**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_Euismod_BioSurvey.aprx

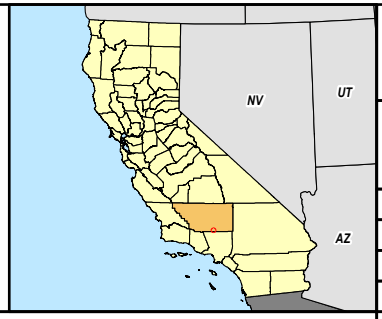
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Exported By: ACLINE on 4/27/2026



LEGEND

WESTERN JOSHUA TREE

- IMPACTED TREE (316)
- ELECTRIC TIE-LINE
- WESTERN JOSHUA TREE SURVEY AREA
- PROJECT SITE
- PRELIMINARY LIMITS OF SITE DISTURBANCE



BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, RINCON, GOOGLE

N

0 300 600 FEET

1:7,200 1" = 600'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

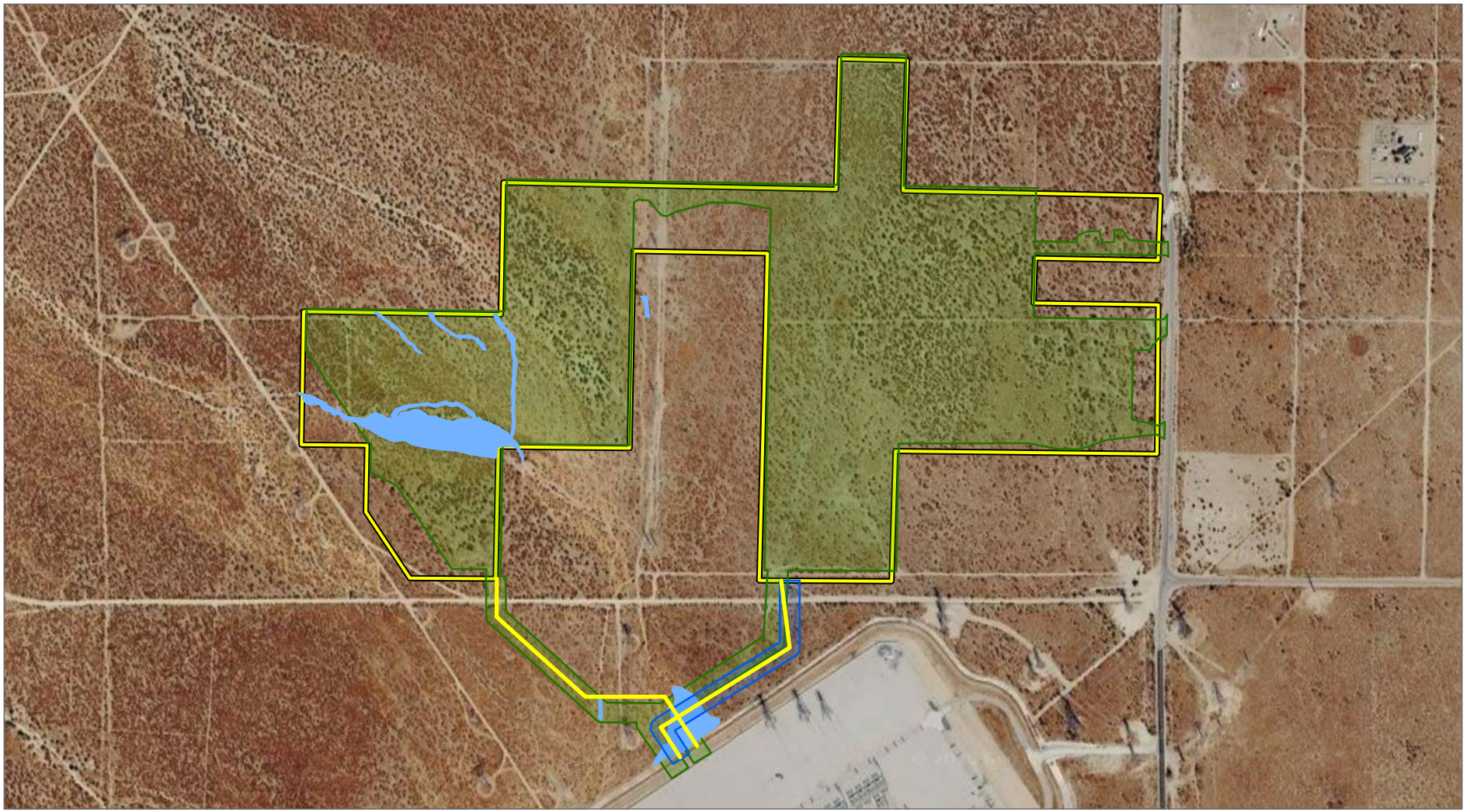
TITLE:
WESTERN JOSHUA TREE LOCATIONS

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 10**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

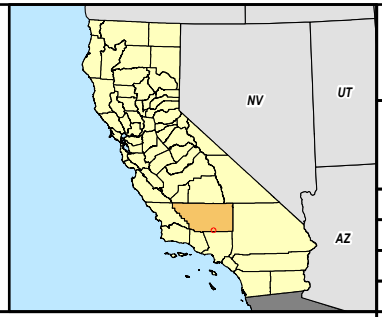
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LEGEND

- PROJECT SITE
- CDFW JURISDICTION
- ELECTRIC TIE-LINE
- PRELIMINARY LIMITS OF SITE DISTURBANCE
- EAST TIE-LINE LIMITS OF DISTURBANCE

CDFW STREAMBED WITHIN LIMITS OF DISTURBANCE:
- ONSITE (2.80 ACRES)
- EAST TIE-LINE (0.57 ACRES)



BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, GOOGLE, CDFW

0 375 750 FEET

1:9,000 1" = 750'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

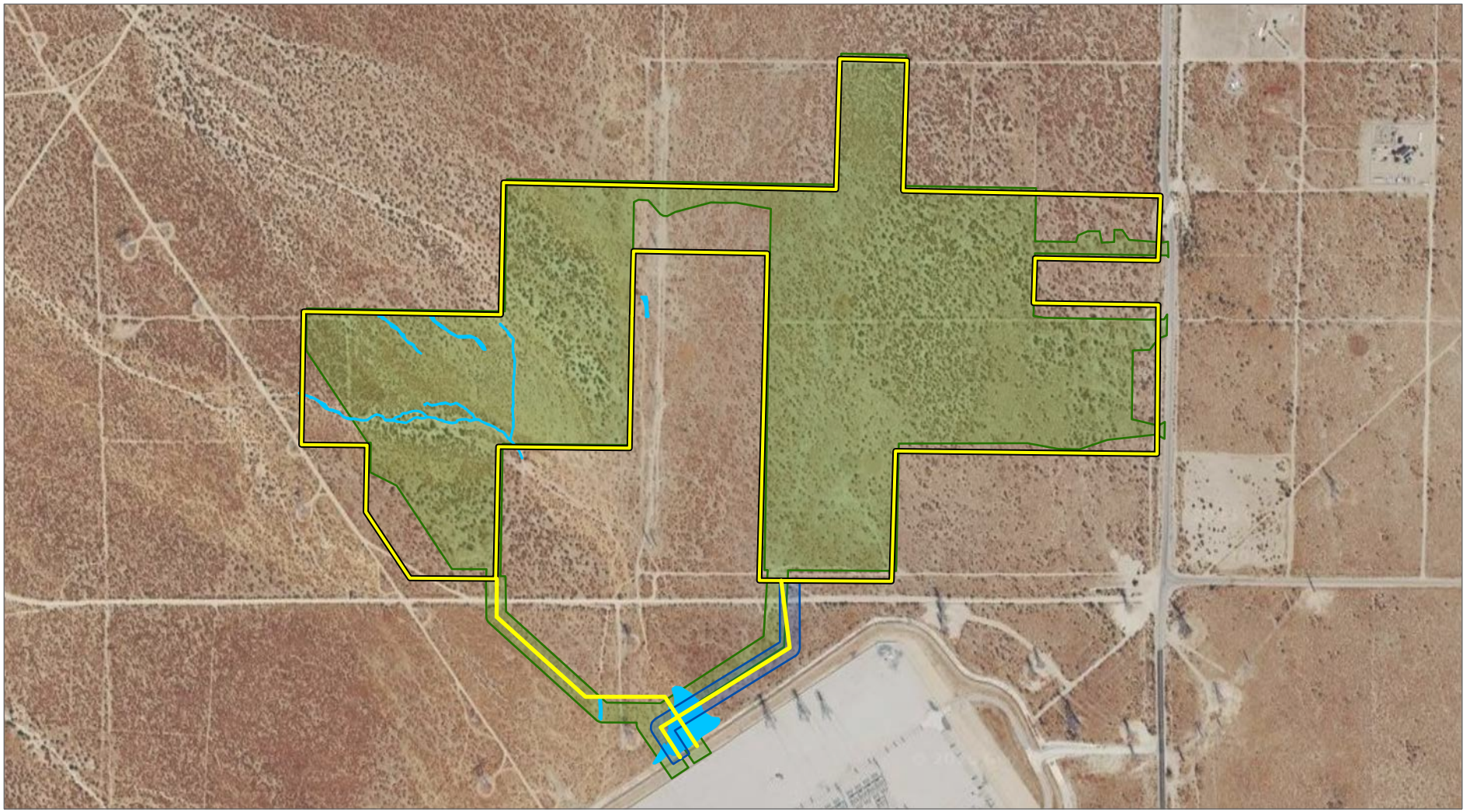
TITLE:
CDFW JURISDICTIONAL STREAMBEDS

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 11**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

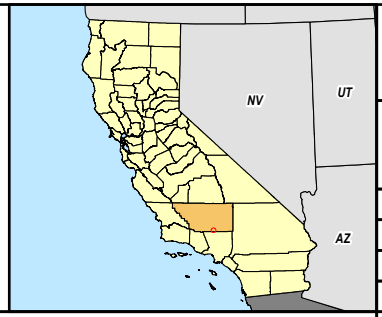
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LEGEND

- PROJECT SITE
- WATERS OF THE STATE
- PRELIMINARY LIMITS OF SITE DISTURBANCE
- EAST TIE-LINE LIMITS OF DISTURBANCE
- EUISMOD TIE LINE

WOS WITHIN LIMITS OF DISTURBANCE:
- ONSITE (0.23 ACRES)
- EAST TIE-LINE (0.57 ACRES)



BASE MAP: GOOGLE EARTH AERIAL IMAGERY SERVICE LAYER
AERIAL DATE: 10/2024
DATA SOURCES: TRC, GOOGLE, MOUNTAIN VIEW BIOLOGICAL CONSULTING 2025

N

0 375 750 FEET

1:9,000 1" = 750'

PROJECT:
EUISMOD PROJECT
KERN COUNTY, CALIFORNIA

TITLE:
WATERS OF THE STATE

DRAWN BY:	A. CLINE	PROJ. NO.:	552398
CHECKED BY:	H. GEDDIE		
APPROVED BY:	J. STENGER		**FIGURE 12**
DATE:	APRIL 2026		

TRC
6 EXECUTIVE CIRCLE
SUITE 200
IRVINE, CA 92614
PHONE: 949.727.9336

FILE: 552398_EUISMOD_BIOSURVEY

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET. MAP ROTATION: 0
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Appendix A
Biological Resource Reports

Biological Resources Assessment (2023)

Biological Resources Assessment

Euismod Site
Kern County, CA

June 2023 Rev 0.1

Prepared For:

Euismod Project I LLC
11801 Domain Boulevard, Suite 450
Austin, TX 78758

Prepared By:

TRC
6 Executive Circle, Suite 200
Irvine, CA 92614

Prepared by: Tanessa Hartwig, Biologist

Reviewed and approved by: Lucy Lin, Environmental Project Manager

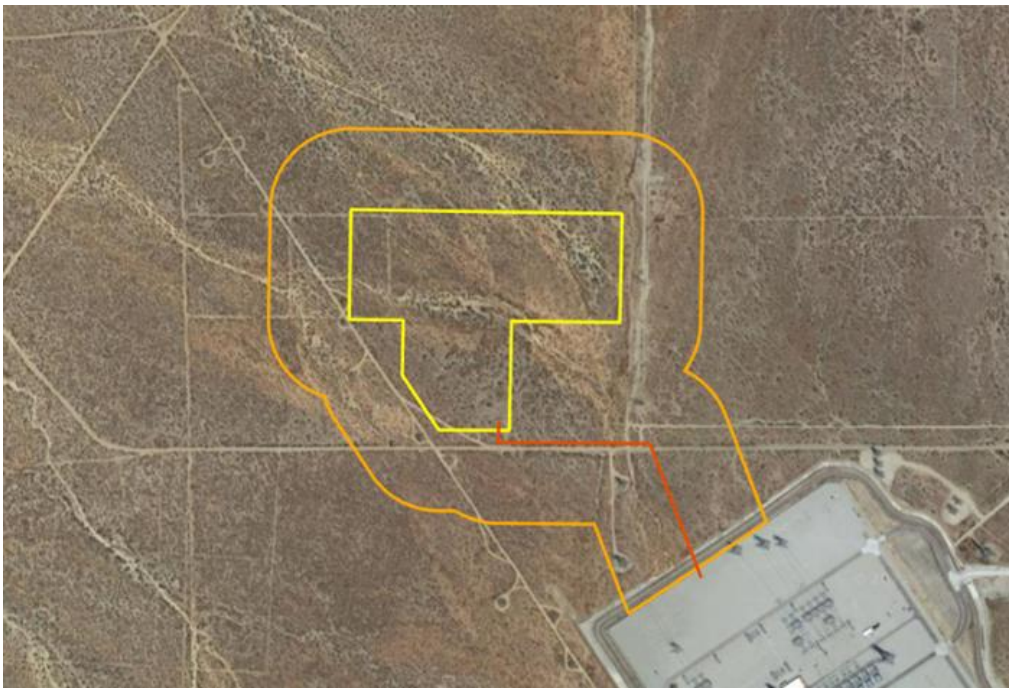


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Executive Summary

In April 2023, TRC Solutions, Inc. biologists performed a biological resources survey of three parcels comprising approximately 34 acres planned for development of the Euismod Project, plus a surrounding 150-meter buffer, and additional lands that could be impacted by the Project's high voltage electric tie-line. The survey date was chosen to correspond to the active season for many wildlife species and the blooming period for many wildflowers, including those with potential to occur in the Project vicinity. The work included a preparatory desktop review to identify sensitive biological resources that could potentially be present, field survey, and preparation of this report. The field survey was conducted by walking meandering east-west transects within the survey area, searching for animal sign in the form of whitewash, feathers, burrows, scat, tracks, vocalizations, etc., and observing and recording observations of animal sign, plant species, and vegetation communities. Creosote bush scrub was the only vegetation community observed in the surveyed area. Joshua trees were observed at multiple locations throughout the survey area. One loggerhead shrike, a California Species of Special Concern, was observed within the 150-meter buffer area. Other than Joshua trees and loggerhead shrike, no individual or sign of special status species was observed in the survey area.

1.0 Introduction

Euismod Project I LLC is proposing to develop a battery energy storage system (BESS) project on an approximately 34-acre site (Site) in eastern Kern County, California (Figure 1). The Site is located in Section 14 of Township 9 North, Range 15 West, San Bernardino Base and Meridian (Figure 2). The Assessor's Parcel Nos. are 261-103-17, 261-103-20 and 261-103-29. At the time of the work described in this report, the Site consisted of primarily undeveloped desert terrain and unpaved roads.

The batteries would be contained in outdoor enclosures. The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Whirlwind 230 kV substation located approximately 0.3 mile to the southeast.

This Biological Resources Assessment documents the methodologies and results of a desktop review and field survey of the proposed Site and adjacent lands within approximately 150 meters of the Site, referred to herein as the Study Area. The purpose of the biological resources review and field survey was to evaluate the potential for presence of special status species or protected habitats on the site or adjacent lands.

1.1 Purpose and Scope

The purpose of this Biological Resources Assessment is to document the biological resources desktop review and field survey methodologies and results. Goals of the work included:

- Determine plant and animal species that are known to occur on and adjacent to the Site.
- Ascertain the presence or likely presence of state or federal special status species.
- Determine the presence of other significant biological elements, habitats, corridors, or communities.

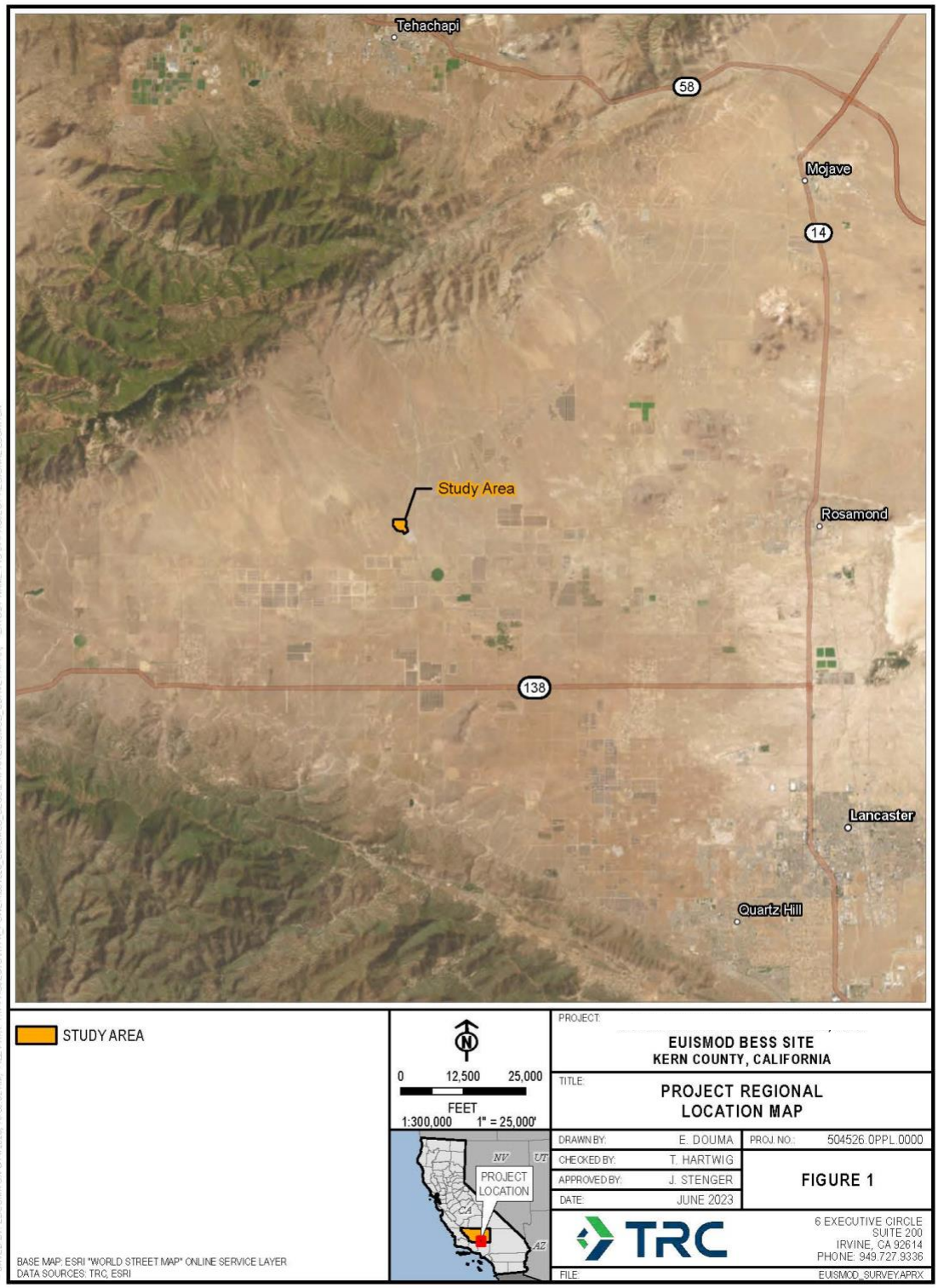


Figure 1: Project Location

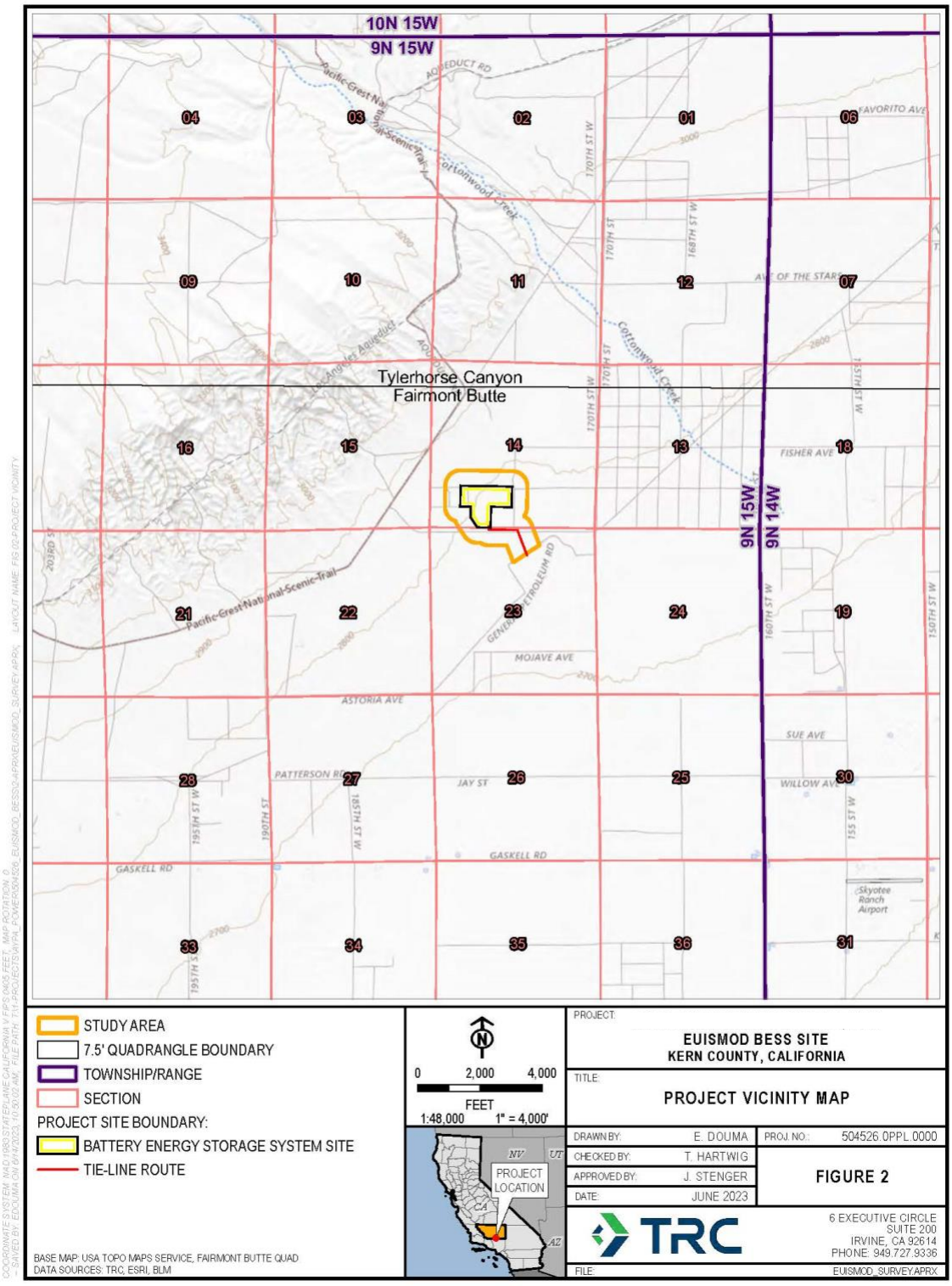


Figure 2: Project Vicinity Aerial Map

1.2 Setting

The proposed Site is an approximately 34-acre parcel about 15 miles west of Rosamond, CA (Figure 1). The parcel is about 100 feet north of an unpaved road that extends west from Rosamond Blvd and is situated about 0.3 mile to the northwest of the Southern California Edison (SCE) Whirlwind Substation. The Site lies within the western Mojave Desert in the shadow of the Tehachapi Mountains to the northwest. The Pacific Crest National Scenic Trail passes by about 0.25 mile to the northwest of the northern perimeter of the Site. There is an existing wind energy generation facility to the northeast. South of the Site, patches of native desert community intermingle with solar panels, agriculture, residential areas, and disturbed (ruderal) land. Figure 3 provides an aerial view of the study area limits.

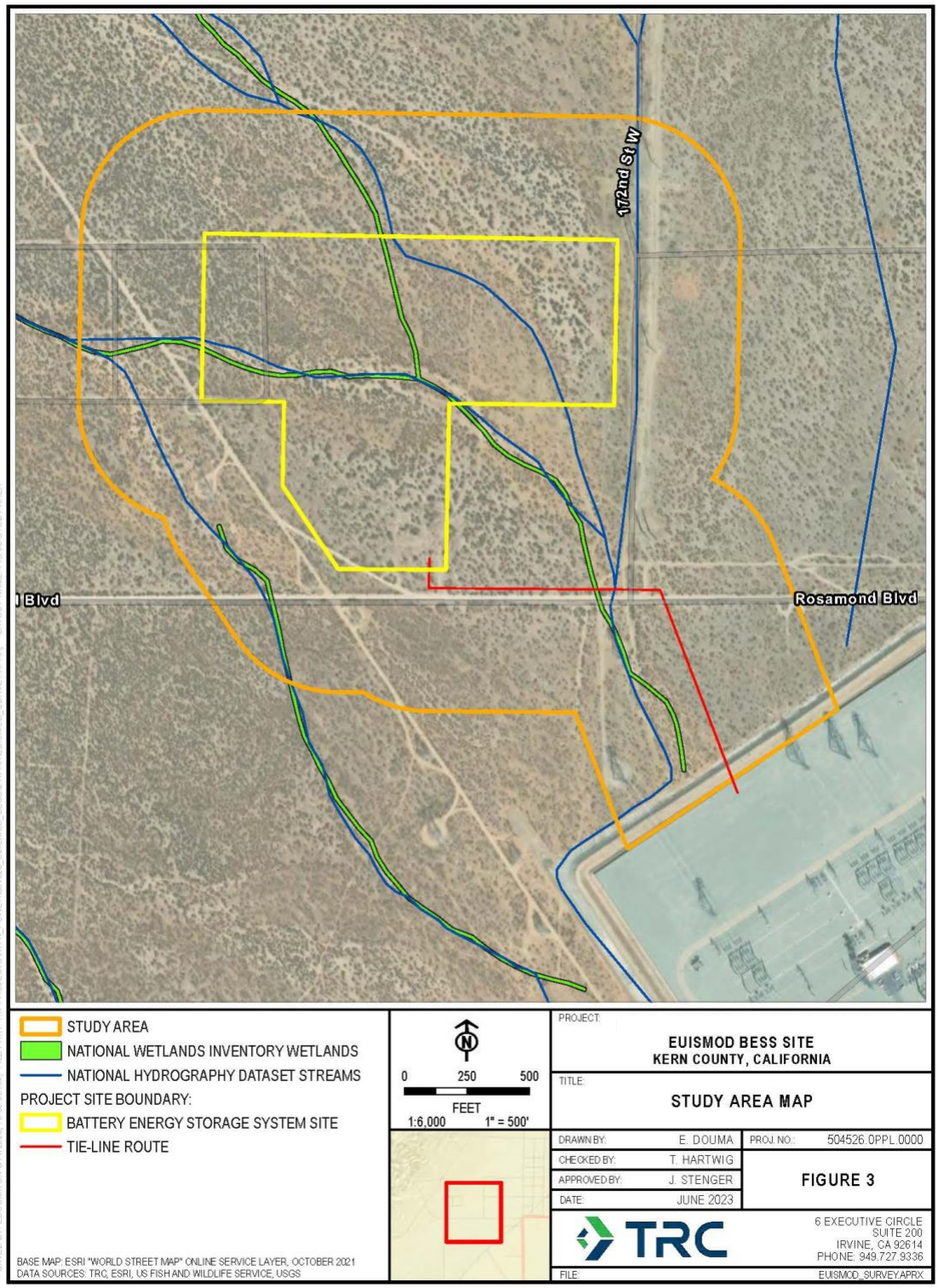


Figure 3: Proposed Right-of-Way

2.0 Regulatory Requirements

2.1 Federal Regulations

2.1.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires federal agencies to review the effects that their actions would have on the environment prior to taking action. It requires all federal agencies to consider the direct, indirect, and cumulative effects of proposed actions and reasonable alternatives prior to making a decision. NEPA requires that all federal actions that could result in a significant effect on the environment to be subject to review by federal agencies with discretion over the action. If the Project requires any federal permits, NEPA may apply.

2.1.2 Federal Endangered Species Act (ESA)

The Endangered Species Act of 1973 (ESA) protects plants and animals that are listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Section 9 of ESA prohibits the taking of endangered wildlife, where taking is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct” (50 Code of Federal Regulations [CFR] 17.3). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any endangered plant on federal land and removing, cutting, digging up, damaging, or destroying any endangered plant on nonfederal land in knowing violation of state law (16 USC 1538). Under Section 7 of ESA, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect a listed (or proposed) species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion, the USFWS may issue an incidental take statement allowing take of the species that is incidental to an otherwise authorized activity provided the activity will not jeopardize the continued existence of the species. Section 10 of ESA provides for issuance of incidental take permits provided a habitat conservation plan is developed.

2.1.3 Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (MBTA) implements international treaties between the United States and other nations devised to protect migratory birds, any of their parts, eggs, and nests from activities such as hunting, pursuing, capturing, killing, selling, and shipping, unless expressly authorized in the regulations or by permit. As authorized by the MBTA, the USFWS issues permits to qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, special purposes (rehabilitation, education, migratory game bird propagation, and salvage), take of depredating birds, taxidermy, and waterfowl sale and disposal. The regulations governing migratory bird permits can be found in 50 CFR part 13 General Permit Procedures and 50 CFR part 21 Migratory Bird Permits.

On December 22, 2017, the U.S. Department of the Interior (DOI) issued Memorandum M-37050, which states that “the statute's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs.” In other words, the MBTA incidental take allowance has been legally modified and excludes avian impacts during lawful construction activities, when the intended purpose of such activities does not include impacting birds. The USFWS codified this memorandum into a final rule in 2020 (USFWS 2020). In 2021,

the USFWS revoked its 2020 rule and returned to implementing the MBTA consistent with judicial precedent and agency practice prior to 2017 (USFWS 2021).

2.1.4 The Bald and Golden Eagle Protection Act (BGEPA)

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the taking or possession of and commerce in bald and golden eagles with very limited exceptions. Under the BGEPA, it is a violation to "take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or any manner, any bald eagle commonly known as the American eagle, or golden eagle, alive or dead, or any part, nest, or egg, thereof." Take is defined to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, and disturb.

2.2 State Regulations

2.2.1 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires State and local agencies to review the effects of their actions on the environment prior to acting on a project unless exempted. It requires that significant environmental impacts, including significant impacts to biological resources, be mitigated to a level that is less than significant, or to the maximum extent practical if the significant impact cannot be mitigated to a level that is less than significant. CEQA is codified in California Public Resources Code Section 21000 *et seq.* and supporting environmental review guidelines are codified in California Code of Regulations Title 14 Section 15000 *et seq*.

2.2.2 California Fish and Game Code

2.2.2.1 California Endangered Species Act (CESA)

The California Endangered Species Act (CESA) generally parallels the main provisions of the ESA, but unlike its federal counterpart, CESA applies the take prohibitions to species proposed for listing (called "candidates" by the state). Section 2080 of the California Fish and Game Code prohibits the taking, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or in the regulations. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects. State lead agencies are required to consult with California Department of Fish and Wildlife (CDFW) to ensure that any action they undertake is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat.

2.2.2.2 Fully Protected Species

The state of California first began to designate species as "fully protected" prior to the creation of the CESA and ESA. Lists of fully protected species were initially developed to provide protection to those animals that were rare or faced possible extinction, and included fish, amphibians and reptiles, birds, and mammals. Most fully protected species have since been listed as threatened or endangered under CESA and/or ESA. The regulations that implement the Fully Protected Species Statute (Fish and Game Code Section 4700) provide that fully protected species may not be taken or possessed at any time. Furthermore, no licenses or permits may be issued for incidental take except for collection of these species for necessary scientific research, relocation of the bird species for the protection of livestock, or if the species is a covered species under a Natural Community Conservation Plan (NCCP).

2.2.2.3 Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 (Fish and Game Code Sections 1900-1913) was created with the intent to “preserve, protect and enhance rare and endangered plants in this state.” The NPPA is administered by CDFW. The Fish and Wildlife Commission has the authority to designate native plants as “endangered” or “rare” and to protect endangered and rare plants from take. The CESA of 1984 (Fish and Game Code Section 2050-2116) provided further protection for rare and endangered plant species, but the NPPA remains part of the Fish and Game Code.

2.2.2.4 Streambed Alteration Agreement

Section 1602 of the Fish and Game Code requires that a Streambed Alteration Application be submitted to CDFW for “any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake.” The CDFW reviews the proposed actions and, if necessary, submits to the Applicant a proposal for measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by CDFW and the Applicant is the Streambed Alteration Agreement.

2.2.2.5 Migratory Birds

CDFW enforces the protection of non-game native songbirds and raptors. These protections are outlined in Sections 3503, 3503.5, and 3800 of the Fish and Game Code. Furthermore, Section 3513 of the Fish and Game Code prohibits the possession or take of birds listed under the federal MBTA. These sections mandate the protection of California non-game native birds’ nests and also make it unlawful to take these birds.

3.0 Methods

3.1 Desktop Review

Prior to conducting the field survey, TRC biologists performed a desktop review to determine the special status species and habitats that have been documented in the project vicinity and their habitat needs compared to habitat characteristics of the proposed Site and adjacent lands. Desktop review included information gathered from the following sources:

- USFWS Information for Planning and Consultation (IPaC) online tool
- California Natural Diversity Data Base (CNDDB)
- California Native Plant Society (CNPS) Inventory of Rare Plants
- Google Earth aerial imagery
- US Geological Survey, The National Map Online Topographic Map
- Natural Resources Conservation Service (NRCS) Web Soil Survey

Based on the desktop review, a list of special status plant and wildlife species with potential to occur in the Study Area was generated. For the purposes of this evaluation, special status species are defined as plants or wildlife that:

- Have been designated as either species of special concern, threatened, endangered, or fully protected by USFWS or the State of California;
- Are candidate species being considered or proposed for listing under the ESA or CESA;
- Are designated as sensitive by the California Native Plant Society.

The habitat preferences and distributional range of species from the database queries were evaluated first by desktop assessment for potential occurrence on the proposed Site or adjacent lands. If required habitat for a species was known to be lacking and/or the Study Area was outside the known distribution or elevation range for a species, the species was "presumed absent." After the field visit, sensitive species were assessed for potential to occur within the Study Area based on the following guidelines:

Present: Species is known to occur (e.g., recorded occurrence, observation, or sign).

High: Highly suitable habitat occurs and the species is known to occur in the vicinity.

Moderate: Suitable habitat for the species occurs and the species is known to occur in the vicinity.

Low: Potential habitat for the species is sub-marginal and/or the species is known to occur in the vicinity.

Unlikely: The species is known to occur in the vicinity but suitable habitat is absent.

None: The species is not known to occur in the vicinity and required habitat is absent.

3.2 Biological Survey

TRC biologist Tanessa Hartwig conducted a biological resource survey of the Study Area on April 18, 2023. The survey date was chosen to take advantage of the active season for many

wildlife species and the blooming period for many wildflowers, including those sensitive species with potential to occur on the Site (see Special Status Species Tables 3 and 4 below). The biologist walked meandering east-west transects within the Study Area, visually scanning the landscape and listening for wildlife activity, including bird songs and calls as well as animal "rustles." Binoculars and a 10x magnifier were used as necessary to identify wildlife and plants. The survey included the following:

- Recording plant and animal species observed
- Observing for the possible presence of special status species
- Evaluating habitat for special status species
- Characterizing vegetation communities and land cover types
- Searching for animal sign in the form of whitewash, feathers, burrows, scat, tracks, vocalizations, etc.
- Taking photographs of the site; and
- Recording weather data.

Vegetation was identified using a dichotomous key (Baldwin et al. 2002) or field guides (e.g., Rundel et al. 2022). Vegetation nomenclature is after the Jepson eFlora (2023). Wildlife nomenclature was developed from California Natural Diversity Database (CDFW 2022), USFWS IPaC website (USFWS 2022), and taxon-specific field guides or websites.

Representative photographs are provided in Appendix A. Lists of plant and animal species observed or detected during the field survey are provided in Appendix B.

4.0 Results

Results of the desktop review and field survey are described in the following sections, including area characteristics, vegetation communities, plants, wildlife, special status species, and sensitive natural communities. Figure 4 provides a visual description of vegetation communities, special status species observations, and potential jurisdictional resources observed. Weather conditions during the survey are noted in Table 1. Weather was recorded using a Kestrel 2000. Temperatures were recorded at waist height in the shade of the biologist.

Table 1: Survey Date, Times, and Conditions

Type of Survey	Date	Time	Temperature (˚F)	Cloud Cover (%)	Wind Speed (mph)
Pedestrian	April 18, 2023	8:30 a.m.	50	20	5.5
	April 18, 2023	2:00 p.m.	57	35	14
	April 18, 2023	4:45 p.m.	58	35	8.6

4.1 Biological Study Area Characteristics

4.1.1 Physiographic Setting

The Study Area is located on alluvial slopes on the south side of the Tehachapi Mountain range at elevations of approximately 2750 to 2830 feet above mean sea level. The ground surface slopes gently to moderately in a northwest-southeast direction. The soils are sandy loams. Soil types as mapped by National Resources Conservation Services (NCRS) are shown in Table 2.

Table 2: Soil Types in the proposed Study Area

Soil Type	Abbreviation	Approx. % of Environmental Study Area
Cajon loamy sand, 2 to 9 percent slopes	CaC	40
Hesperia fine sandy loam, 2 to 5 percent slopes	HkB	48
Rosamond fine sandy loam	Rp	12

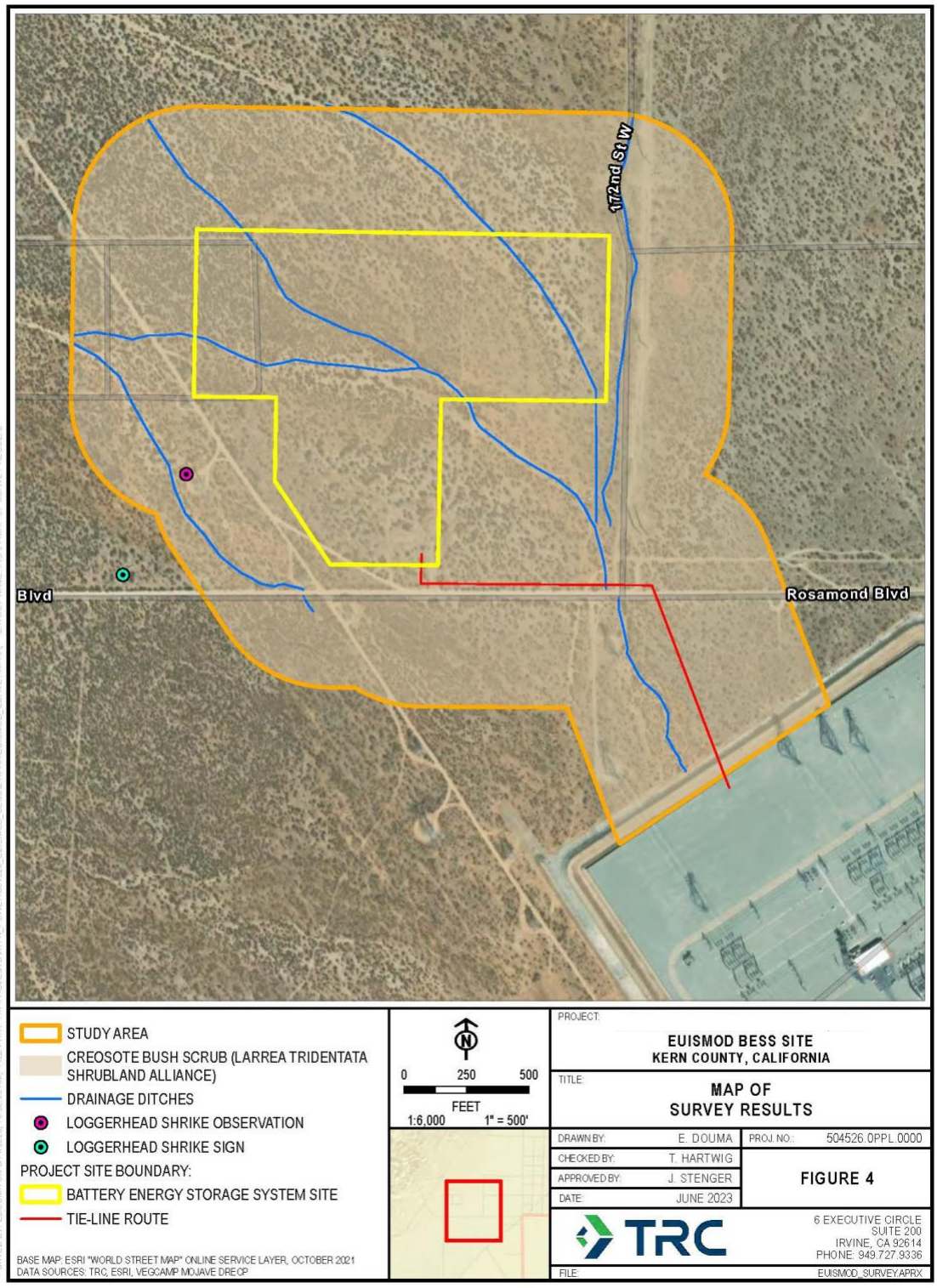


Figure 4: Landcover and Vegetation Communities

4.1.2 Vegetation Communities and Plants

Creosote Bush Scrub (*Larrea tridentata* Shrubland Alliance)

Vegetation communities on the Site were mapped as creosote bush (*Larrea tridentata*) scrub alliance by the Desert Renewable Energy Conservation Plan (Menke et al. 2016), with Joshua tree (*Yucca brevifolia*) cover estimated to be 0 – 1% of the total ground cover. The field survey confirmed that the Site is creosote bush scrub. Based on the lack of a central stem in most plants, the dominance of creosote, and the presence of well-spaced creosote "circles," the community appeared to be a mature creosote scrub community. Creosote bush scrub was the only vegetation community observed on the Site.

Creosote bush scrub is characterized as an open shrub community with creosote dominant or co-dominant in the shrub canopy (Sawyer et al. 2009). Other shrubs that co-occur may include: Shockley's goldenhead (*Acamptopappus shockleyi*), rayless goldenhead (*Acamptopappus sphaerocephalus*), white bursage (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), spiny saltbush (*Atriplex confertifolia*), desert holly (*Atriplex hymenelytra*), allscale saltbush (*Atriplex polycarpa*), woolly brickellia (*Brickellia incana*), brittlebush (*Encelia farinosa*), California ephedra (*Ephedra californica*), Nevada ephedra (*Ephedra nevadensis*) and Anderson wolfberry (*Lycium andersonii*). Emergent trees may be present at low cover, including honey mesquite (*Prosopis glandulosa*) or Joshua tree. The herbaceous layer is composed of seasonal annuals or perennial grasses. Aerial cover by the shrub layer and herb layer varies from open to intermittent.

The creosote bush scrub community on the Site was dominated by creosote. The shrub community was open; shrubs were typically spaced 4 to 20 feet apart. Other shrubs present within the Site included: rayless goldenhead, green ephedra (*Ephedra viridis*), rubber rabbitbrush (*Ericameria nauseosa*), Mojave Desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium)*, Anderson wolfberry, and peach thorn (*Lycium cooperi*). The herbaceous layer was relatively diverse and composed primarily of native herbs and a few native grasses. Native herbs included: pale yellow sun cup (*Camissoniopsis pallida*), California goldfields (*Lasthenia californica*), leafy stemmed coreopsis (*Leptosyne calliopsidea*), Fremont's phacelia (*Phacelia fremontii*), lacy phacelia (*P. tanacetifolia*), and thistle sage (*Salvia carduacea*). Non-native herbs and grasses were also present, and included: red brome (*Bromus rubens*), downy chess (*B. tectorum*), foxtail barley (*Hordeum murinum*), and tumble mustard (*Sisymbrium altissimum*). The herb layer was very dense under shrub canopies. Appendix B provides a list of vascular plant species observed during the site visit.

4.1.3 Aquatic Resources

The National Hydrography Dataset and National Wetland Inventory map identified two intermittent streams on the Site, one bisecting the Site and one near the northeast corner of the Site (Figure 3). The field visit confirmed these drainages and identified two additional drainages within the 150-meter study limits (Figure 4). These drainages have characteristics that may make them jurisdictional resources (e.g., bed and bank, ordinary high water mark, change in substrate) and may be "waters of the state" subject to jurisdiction of the Lahontan Regional Water Quality Control Board (RWQCB) and/or the California Department of Fish and Wildlife (CDFW). The drainages exhibit braiding and branching typical of arid west drainages on alluvial slopes. This watershed is internally drained and considered isolated by the USACE. Therefore, aquatic resources within the Study Area are not likely to be federally jurisdictional.

4.1.4 Migration Pathway, Wildlife Movement Corridor, Linkages

Linkages and corridors facilitate regional animal movement and can consist of features such as waterways, riparian corridors, mountain passes, contiguous habitat, and other physical features. The habitat surrounding the Site consists of open space to the north, east, and west; there is ample room for wildlife movement throughout the area and no unique corridor in the Study Area. The drainages on the Site do not have densely vegetated riparian corridors and drain to a man-made ditch along the substation; therefore, they do not provide high quality corridor habitat.

4.2 Wildlife

Most wildlife observed or detected during the survey were native birds. These included: ash-throated flycatcher (*Myiarchus cinerascens*), common raven (*Corvus corax*), loggerhead shrike (species of special concern; *Lanius ludovicianus*), northern mockingbird (*Mimulus polyglottis)*, red-tailed hawk *(Buteo jamaicensis)*, and white-crowned sparrow (*Zonotrichia leucophrys*). A non-native bird, European starling (*Sturnus vulgaris*), was also observed using the Study Area. Coyote (*Canis latrans*) was heard in the surrounding area.

There were also many small mammal burrows within the Study Area. Observed burrows were about 6 centimeters (cm) in diameter and circular. A few burrows had signs of tail drag at the burrow and foraging diggings nearby, indicating potential use by kangaroo rat (*Dipodomys* sp.). Based on the size of the burrows and habitat, the most likely species of kangaroo rat within the Study Area is Merriam's kangaroo rat (*Dipodomys merriami*). Appendix A, Photo 9 provides a representative photo of a kangaroo rat burrow. Other species that may use burrows of this size include lizards, grasshopper mice (*Onychomys* sp.), and certain ground squirrels (*Ammospermophilus* sp.). Burrowing owls (*Athene cunicularia*) may modify kangaroo rat burrows to suit their needs. Protocol surveys for desert tortoise and burrowing owl were not performed as part of this biological reconnaissance survey. However, observed burrows did not show signs of occupancy by desert tortoise or burrowing owl.

A list of wildlife species observed or identified by sign during the survey is included in Appendix B.

4.3 Sensitive Biological Resources

4.3.1 Special Status Habitats

No sensitive natural communities are present in the Study Area. Creosote bush scrub is a widespread native plant community in the Mojave Desert.

4.3.2 Special Status Plants

The potential for special status plant species to occur within the Study Area based on the desktop review and field assessment of habitat present is provided in Table 3. The species identified in Table 3 were compiled from a CNDDB 3-mile radius search (Appendix C), the online IPaC tool (Appendix D), and the CNPS list of rare plants. Table 3 addresses the special status plant species identified as having potential habitat present during the desktop review and thus having low, moderate, or high potential to occur, as described in the methods (Section 3.1).

One species, Clokey's cryptantha (*Cryptantha clokeyi*), was determined to have high potential to be regionally present and occur in the Study Area. Six special status species, including one

federally listed species, were determined to have low potential to occur within the Study Area. No special status plants listed in Table 3 were detected during the survey. However, Joshua tree (*Yucca brevifolia*), a Candidate for listing under the California Endangered Species Act, was observed at multiple locations throughout the Study Area.

Table 3: Potential Special Status Plants

Species	Status* Federal/State/CRPR	Habitat Requirements	Potential to Occur
Plants			
Alkali mariposa-lily *Calochortus striatus*	-- / -- / 1B.2	Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps. Alkaline meadows and ephemeral washes. Prefers alkaline and mesic substrates. Elevation: 70-1600m. Bloom Period: Apr-Jun	Low potential to occur. Ephemeral washes are present on site. Potential alkaline soils are mapped on site. However, associated halophytes (e.g., *Atriplex, Distichlis*) not observed during April survey. Not observed during April survey.
Aparejo grass *Muhlenbergia utilis*	-- / -- / 2B.2	Meadows and seeps, marshes and swamps, chaparral, coastal scrub, cismontane woodland. Sometimes alkaline, sometimes serpentinite. Elevation: 25-2325 m. Bloom Period: Mar-Oct	Low potential to occur. Potentially alkaline soils in scrub habitat present on site, however preferred wet habitats are not on site. In addition, other halophytes not observed during April survey. Not observed during April survey.
Bakersfield cactus *Opuntia basilaris* var. *treleasei*	E / E / 1B.1	Chenopod scrub, valley and foothill grassland, cismontane woodland. Coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats, within grassland. Elevation: 85-550 m. Bloom Period: Apr-May	Low potential to occur. Well-drained granitic sandy loams on flats are located on site. However, preferred grassland or chenopod scrub habitats not observed on site and site is outside typical elevation range. Not observed during April survey.
Clokey's cryptantha *Cryptantha clokeyi*	-- / -- / 1B.2	Mojavean desert scrub. Sandy or gravelly soils. Elevation: 750-1890 m. Bloom Period: Apr-Jun	High potential to occur. Sandy or gravely soils in desert scrub are present on site. Not observed during April survey.
Fort Tejon woolly sunflower *Eriophyllum lanatum* var. *hallii*	-- / -- / 1B.1	Chaparral, cismontane woodland. Often on slopes in loamy soils. Elevation: 1065-1435 m. Bloom Period: May-Jul	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. Not observed during April survey.

Species	Status* Federal/State/CRPR	Habitat Requirements	Potential to Occur
Plants			
Greata's aster *Symphyotrichum greatae*	-- / -- / 1B.3	Chaparral, cismontane woodland, broadleafed upland forest, lower montane coniferous forest, riparian woodland. Mesic canyons. Elevation: 335-2015 m. Bloom Period: Jun-Oct	Unlikely to occur. Suitable habitat is not present on site. Not observed during April survey.
Horn's milk-vetch *Astragalus hornii* var. *hornii*	-- / -- / 1B.1	Meadows and seeps, playas. Lake margins, alkaline sites. Elevation: 75-350 m. Bloom Period: May-Oct	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. Not observed during April survey.
Madera leptosiphon *Leptosiphon serrulatus*	-- / -- / 1B.2	Cismontane woodland, lower montane coniferous forest. Dry slopes; often on decomposed granite in woodland. Elevation: 80-1645 m. Bloom Period: Apr-May	Unlikely to occur. Suitable habitat is not present on site. Not observed during April survey.
Peirson's lupine *Lupinus peirsonii*	-- / -- / 1B.3	Joshua tree woodland, pinyon and juniper woodland, lower montane coniferous forest, upper montane coniferous forest. Decomposed granite slide and talus, on slopes and ridges. Elevation: 1400-2380 m. Bloom Period: Apr-Jun	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. Not observed during April survey.
Robbins' nemacladus *Nemacladus secundiflorus* var. *robbinsii*	-- / -- / 1B.2	Chaparral, valley and foothill grassland. Dry, sandy or gravelly slopes. Openings. Elevation: 360-1710 m. Bloom Period: Apr-Jun	Low potential to occur. Suitable substrates are present on site; however, site lacks suitable vegetation communities. Not observed during April survey.
Salt spring checkerbloom *Sidalcea neomexicana*	-- / -- / 2B.2	Playas, chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub. Alkali springs and marshes. Elevation: 3-2380 m. Bloom Period: Mar-Jun	Low potential to occur. Prefers mesic habitats. Not observed during April survey.

Species	Status* Federal/State/CRPR	Habitat Requirements	Potential to Occur
Plants			
San Fernando Valley spineflower *Chorizanthe parryi* var. *fernandina*	-- / SE / 1B.1	Coastal scrub, valley and foothill grassland. Sandy soils. Elevation: 15-1015 m. Bloom Period: Apr-Jul	Unlikely to occur. Not known to occur north of Los Angeles County. Preferred sandy coastal scrub habitat is not present on site. Not observed during April survey.
Short-joint beavertail *Opuntia basilaris* var. *brachyclada*	-- / -- / 1B.2	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Sandy soil or coarse, granitic loam. Elevation: 425-2015 m. Bloom Period: Apr-June; Aug	Unlikely to occur. Not known to occur outside of Los Angels and San Bernardino Counties. Not observed during April survey.
Slender mariposa-lily *Calochortus clavatus* var. *gracilis*	-- / -- / 1B.2	Chaparral, coastal scrub, valley and foothill grassland. Shaded foothill canyons; often on grassy slopes within other habitat. Elevation: 210-1815 m. Bloom Period: Mar-Jun; Nov	Unlikely to occur. Shaded foothills and grassy slopes are not present on site. Not observed during April survey.
Southern jewelflower *Streptanthus campestris*	-- / -- / 1B.3	Chaparral, lower montane coniferous forest, pinyon and juniper woodland. Open, rocky areas. Elevation: 605-2590 m. Blooming Period: Apr-Jul	Unlikely to occur. Suitable habitat is not present on site. Not observed during April survey.
Spreading navarretia *Navarretia fossalis*	FT / -- / 1B.1	Vernal pools, chenopod scrub, marshes and swamps, playas. San Diego hardpan and San Diego claypan vernal pools; in swales & vernal pools, often surrounded by other habitat types. Elevation: 15-850 m. Blooming Period: Apr-Jun	Unlikely to occur. Suitable habitat is not present on site. Not observed during April survey.

Species	Status* Federal/State/CRPR	Habitat Requirements	Potential to Occur
Plants			
Tehachapi monardella *Monardella linoides* ssp. *oblonga*	-- / -- / 1B.3	Lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland. On dry slopes of yellow pine forest, decomposed granitic soils; also in roadside disturbed areas. Elevation: 1430-2655 m. Blooming Period: May-Aug	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. Not observed during April survey.
Tejon poppy *Eschscholzia lemmonii* ssp. *kernensis*	-- / -- / 1B.1	Valley and foothill grassland, chenopod scrub. Little information available on habitat. Elevation: 135-1355 m. Blooming Period: Feb-May	Low potential to occur. Suitable grassland habitat is not present on site; however open areas on site may provide some habitat. Not observed during April survey.

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

California Rare Plant Rank (CRPR)

1A Plant assumed extinct in California

1B Plants rare, threatened, or endangered in California and elsewhere

2 Plants rare, threatened, or endangered in California, but more common elsewhere

Threat Ranks

0.1-Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2-Fairly threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3-Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

4.3.3 Special Status Wildlife

The potential for special status wildlife species to occur on or adjacent to the proposed Study Area based on the desktop review and field survey is provided in Table 4. The species identified in Table 4 were compiled from a CNDDB 3-mile radius search (Appendix C) and the online IPaC tool (Appendix D). Table 4 addresses wildlife species of special concern identified as having habitat present during the desktop review and field survey and thus having low, moderate, or high potential to occur, as described in the methods (Section 3.1).

A total of seven special status wildlife species were identified with high potential to be regionally present and have potential habitat in the Study Area. These seven wildlife species were either documented in the vicinity in the past or were determined to have a high potential to occur in the Study Area based on the presence of suitable habitat. One of these species, loggerhead shrike (SSC), was detected by direct observation during the field survey. No other special status wildlife species were observed during the survey (Table 4, Appendix B).

Table 4. Potential Special Status Wildlife

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
Reptiles			
Desert tortoise *Gopherus agassizii*	FT / ST	Most common in desert scrub, desert wash, and Joshua tree habitats; occurs in almost every desert habitat. Require friable soil for burrow and nest construction. Creosote bush habitat with large annual wildflower blooms preferred.	High potential to occur. The project site is along the margin of the species' range; however, potentially suitable habitat is present on site, and active burrows have been observed approximately 1 mile northwest of the site as recently as 2010. Tortoise half-moon burrows were not observed during April survey.
Northern California legless lizard *Anniella pulchra*	-- / SSC	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. They prefer soils with a high moisture content.	High potential to occur. Sandy soils, sparse vegetation, and ephemeral washes occur on site. The nearest CNDDB occurrence is adjacent to the proposed tie-line.
Birds			
Burrowing owl *Athene cunicularia*	-- / SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	Moderate potential to occur. Typically occurs in areas with low-growing vegetation (< 1m) and small mammal burrows > 11 cm diameter. Burrows observed on site were about 6 cm diameter. However, may use openings in creosote scrub, along roads, or powerlines. Has been observed about 0.3 mile from site (eBird).

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
California condor *Gymnogyps californianus*	FE / SE, FP	Require vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Deep canyons containing clefts in the rocky walls provide nesting sites. Forages up to 100 miles from roost/nest.	Moderate potential to occur (forage/transit). May forage through the site but unlikely to nest in the project vicinity due to lack of deep canyons. Known to occur within 10 miles of site.
Costa's hummingbird *Calypte costae*	-- / --	Desert riparian, desert and arid scrub foothill habitats.	High potential to occur. Known to occur in the site vicinity (eBird). Suitable nesting habitat is present in the desert scrub.
Ferruginous hawk *Buteo regalis*	-- / --	Open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats. Eats mostly lagomorphs, ground squirrels, and mice. Population trends may follow lagomorph population cycles.	High potential to occur (seasonal). Known to overwinter near the site. Unlikely to nest-breeds northeast of CA. However, may forage in or roost in the site during winter.
Golden eagle *Aquila chrysaetos*	-- / FP	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	Moderate potential to occur. Known to occur in the site vicinity in winter (eBird, CNBBD). Unlikely to nest due to lack of preferred nesting habitat, but occasionally uses transmission towers. May forage in or transit the site.
Le Conte's thrasher *Toxostoma lecontei*	-- / SSC	Desert resident; primarily of open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub habitats. Commonly nests in a dense, spiny shrub or densely branched cactus in desert wash habitat, usually 2-8 feet above ground.	High potential to occur. Known to occur in the site vicinity. Potential to nest in suitable habitat on site.
Loggerhead shrike *Lanius ludovicianus*	-- / SSC	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub & washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	Present. Observed in the Study Area during April survey. Cache of prey also observed just outside Study Area. Potential to nest in suitable habitat on site.
Long-eared owl *Asio otus*	-- / SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	Low potential to occur. Known to occur in the site vicinity uncommonly. May forage on site. Unlikely to nest on site due to lack of suitable nesting habitat.

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
Merlin *Falco columbarius*	-- / --	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands & deserts, farms & ranches. Clumps of trees or windbreaks are required for roosting in open country.	Moderate potential to occur (seasonal). Known to occur in the site vicinity in winter. May transit or forage on site. Unlikely to nest on site – breeds further north.
Mountain plover *Charadrius montanus*	-- / SSC	Short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms. Short vegetation, bare ground, and flat topography. Prefers grazed areas and areas with burrowing rodents.	Low potential to occur (seasonal). Known to occur in the site vicinity in winter. However, prefers agricultural fields or grassland when wintering. May transit or forage on site.
Prairie falcon *Falco mexicanus*	-- / --	Inhabits dry, open terrain, either level or hilly. Breeding sites located on cliffs. Forages far afield, even to marshlands and ocean shores.	High potential to occur. Known to occur in the site vicinity. May transit or forage on site. Unlikely to nest on site due to lack of suitable cliff-side nesting habitat; however occasionally known to nest in transmission towers.
Swainson's hawk *Buteo swainsoni*	-- / ST	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	Moderate potential to occur. Active nest observed as recently as 2020 approximately 2 miles southeast of site. May transit or forage on site. Preferred foraging habitat is grassland or agricultural. Potential to nest in adjacent transmission towers.
Tricolored blackbird *Agelaius tricolor*	-- / ST, SSC	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	Low potential to occur. Known to occur in the vicinity of the site (eBird). May transit or forage on site; however, typically forages in agricultural fields or wetlands. Unlikely to nest on site due to lack of suitable nesting habitat.
Mammals			
San Joaquin pocket mouse *Perognathus inornatus*	-- / --	Grassland, oak savanna and arid scrubland in the southern Sacramento Valley, Salinas Valley, San Joaquin Valley and adjacent foothills, south to the Mojave Desert. Associated with fine-textured, sandy, friable soils.	Low potential to occur. Known to occur in the vicinity of the project. However, typically found in more open, flat grassland or woodland. Site is not within CDFW predicted habitat (CDFW 2021; CWHR M087).

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
Tulare grasshopper mouse *Onychomys torridus tularensis*	-- / SSC	Hot, arid valleys and scrub deserts in the southern San Joaquin Valley. Diet almost exclusively composed of arthropods, therefore needs abundant supply of insects.	High potential to occur. Known to occur in the vicinity of the project. Grasshopper mice are often associated with kangaroo rats; kangaroo rat burrows were observed on the site. CDFW predicted habitat is mapped as highly suitable (CDFW 2021; CWHR M122).

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

-- Tracked by CNDDB, but not federally or state listed

5.0 Discussion and Recommendations

To comply with environmental permitting and reduce project impacts, the following measures are recommended:

1. **Agency coordination for input regarding special status species**. TRC recommends early coordination with the USFWS and CDFW to discuss the following:

    a. **Desert Tortoise (Federally and State Threatened).** No desert tortoise or any sign thereof was observed during the field survey. However, the Site is within the range of desert tortoise as mapped by CDFW (CWHR R005 [ds905]; CDFW 2021), and the habitat observed within the Study Area appears to be suitable for desert tortoise. The CNDDB includes a known observation of a desert tortoise about one mile northwest of the site observed in 2010. Based on these factors, TRC expects that USFWS and CDFW will require a protocol desert tortoise survey to more definitively determine presence or absence.

    b. Swainson's Hawk (State Threatened). The CNDDB identifies the presence of a Swainson's hawk nest that was observed to be active approximately two miles southeast of the Site in 2020. For renewable energy projects in the Antelope Valley, CDFW considers a Swainson's hawk nest site to be active if it was used at least once during the past five years (CEC & CDFW 2010). The CDFW considers impacts to suitable habitat or individual birds within a five-mile radius of an active nest significant under CEQA and to have the potential for "take" of Swainson's hawks. TRC recommends early coordination with the CDFW to determine if they will require a protocol-level survey and to obtain CDFW input for planning Swainson's hawk mitigation pursuant to CEQA.

    c. Burrowing Owl (State Species of Special Concern). No burrowing owl or any sign thereof was observed during the field visit. However, portions of the Site contain moderate potential for nesting habitat for burrowing owl. TRC recommends early coordination with the CDFW to determine if they will require a focused burrowing owl survey to more definitively determine presence or absence. A burrowing owl habitat assessment report following CDFW Staff Report guidelines may be needed to determine potential project impacts (CDFW 2012).

    d. **Tulare Grasshopper Mouse (State Species of Special Concern)**. This Site is within habitat predicted as highly suitable for Tulare grasshopper mouse by the CDFW. In addition, Tulare grasshopper mice are often associated with kangaroo rat burrows, which were observed within the Site. TRC recommends early coordination with CDFW to determine if they will require any further survey work to determine presence or absence of this species.

2. **Joshua tree inventory**. As a Candidate for listing, the tree provisionally receives the same protections as a state-listed endangered or threatened species. A decision on listing the tree is currently delayed until after the passage or defeat of the Western Joshua Tree Conservation Act, scheduled for summer or fall 2023. TRC recommends

waiting for a listing decision or final action on the Act if the project schedule allows. If the schedule does not allow, then TRC recommends conducting a Joshua tree inventory.

3. **Aquatic features delineation surveys**. A qualified wetland delineator should conduct an aquatic features delineation to determine the boundaries and characteristics relevant to potential jurisdiction of the aquatic features within the Study Area.

4. **Nesting birds and raptor surveys**. The transmission poles and shrubs within the Study Area provide suitable nesting habitat for a wide variety of migratory birds, including special status raptors and loggerhead shrike. Raptors and migratory birds are protected by the MBTA and California Fish and Game Code (Section 2). If project activities are scheduled during the breeding season (February 1 through September 1), TRC recommends that standard minimization and avoidance measures be followed. These measures include, but are not limited to, pre-construction surveys and avoidance of active bird nests through the use of a work exclusion buffer zone. TRC recommends consulting with a qualified biologist 45 days or more prior to the start of project activities to develop an appropriate nesting bird risk management strategy suited to the project since construction delays can be costly.

5. **Rare plants.** No special status plant species were observed during the April 18, 2023 field survey. This biological resources assessment was conducted in accordance with CDFW's protocols for surveying special status plants (CDFW 2018) in that all taxa were identified to the taxonomic level necessary to determine rarity; natural communities were identified; and the Study Area was traversed systematically to ensure thorough coverage relative to habitat diversity and structure. TRC recommends early coordination with CDFW to determine if they will require any further survey work to determine presence or absence of rare plants.

6. **Pre-construction surveys for special status wildlife**. TRC recommends pre-construction surveys by a qualified biologist for sensitive wildlife with potential to occur within the Study Area. Pre-construction surveys are typically conducted within seven days of the start of project activities. Wildlife surveys should be conducted at the appropriate times of day to detect both crepuscular and diurnal species.

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Appendix A

Site Photographs



Photo 1. Looking South. South of Access Road.



Photo 2. Looking Northwest. South of Access Road.



Photo 3. Looking South. Intermittent Drainage North of Access Road.



Photo 4. Looking North. North of Access Road, West Side of Site. Note Joshua Trees in Distance.



Photo 5. Looking North. North of Access Road.



Photo 6. Looking South. Intermittent Drainage North of Access Road.



Photo 7. Looking Southeast. North of Access Road, East Side of Site.



Photo 8. Joshua Trees on Project Site.



Photo 9. Kangaroo Rat Burrow.



Photo 10. Loggerhead Shrike Sign.

Appendix B

Plants and Wildlife Observed or Detected by Sign

Observed Plants, Euismod BESS Site, Kern County, CA. April 18, 2023.

Family	Species	Common Name	Cal IPC^ or Special Status Rank
AGAVACEAE - AGAVE FAMILY	*Yucca brevifolia*	Joshua tree	State Candidate
ASTERACEAE - SUNFLOWER FAMILY	*Acamptopappus sphaerocephalus*	rayless goldenhead	
ASTERACEAE - SUNFLOWER FAMILY	*Ambrosia dumosa*	white bur-sage	
ASTERACEAE - SUNFLOWER FAMILY	*Ericameria nauseosa*	rubber rabbitbrush	
ASTERACEAE - SUNFLOWER FAMILY	*Lasthenia* sp.	Goldfields, probably *gracilis*	
ASTERACEAE - SUNFLOWER FAMILY	*Leptosyne calliopsidea*	leafstem tickseed	
ASTERACEAE - SUNFLOWER FAMILY	*Malacothrix glabrata*	smooth desert dandelion	
BORAGINACEAE - BORAGE FAMILY	*Amsinckia tessellata*	tessellated fiddleneck	
BORAGINACEAE - BORAGE FAMILY	*Pectocarya linearis* ssp. *ferocula*	narrow-toothed pectocarya	
BORAGINACEAE - BORAGE FAMILY	*Phacelia fremontii*	Fremont's phacelia	
BORAGINACEAE - BORAGE FAMILY	*Phacelia tanacetifolia*	lacy phacelia	
BRASSICACEAE - MUSTARD FAMILY	*Sisymbrium altissimum**	tumble mustard	
CACTACEAE - CACTUS FAMILY	*Cylindropuntia echinocarpa*	silver cholla	
CHENOPODIACEAE - GOOSEFOOT FAMILY	*Grayia spinosa*	spiny hopsage	
EPHEDRACEAE - EPHEDRA FAMILY	*Ephedra viridis*	green ephedra	
GERANIACEAE - GERANIUM FAMILY	*Erodium cicutarium**	redstem filaree	Cal IPC-Limited
LAMIACEAE - MINT FAMILY	*Salvia carduacea*	thistle sage	
LAMIACEAE - MINT FAMILY	*Salvia columbariae*	chia	
MALVACEAE - MALLOW FAMILY	*Eremalche exilis*	white fivespot	
MONTIACEAE - MINER'S-LETTUCE FAMILY	*Calyptridium monandrum*	common pussypaws	
NYCTAGINACEAE - FOUR O'CLOCK FAMILY	*Mirabilis laevis*	wishbone plant	
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissonia campestris*	Mojave suncup	
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissoniopsis pallida*	pale yellow suncup	
OROBANCHACEAE - BROOM-RAPE FAMILY	*Castilleja exserta*	purple owl's clover	
POACEAE - GRASS FAMILY	*Bromus madritensis* ssp. *rubens**	red brome	Cal IPC-High
POACEAE - GRASS FAMILY	*Bromus tectorum**	cheat grass	Cal IPC-High

Family	Species	Common Name	Cal IPC^ or Special Status Rank
POACEAE - GRASS FAMILY	*Hordeum murinum**	wall barley	Cal IPC-Moderate
POACEAE - GRASS FAMILY	*Poa secunda*	one-sided blue grass	
POACEAE - GRASS FAMILY	*Stipa hymenoides*	indian rice grass	
POACEAE - GRASS FAMILY	*Stipa lepida*	foothill needle grass	
POLEMONIACEAE - PHLOX FAMILY	*Gilia* sp.	gilia	
POLYGONACEAE - BUCKWHEAT FAMILY	*Eriogonum fasciculatum* var. *polifolium*	hairy California buckwheat	
SOLANACEAE - NIGHTSHADE FAMILY	*Lycium andersonii*	Anderson's box-thorn	
SOLANACEAE - NIGHTSHADE FAMILY	*Lycium cooperi*	Cooper's box-thorn	
THEMIDACEAE - BRODIAEA FAMILY	*Dichelostemma capitatum*	blue dicks	

*non-native
^Cal IPC = California Invasive Plant Council

Cal IPC Ratings (from https://cal-ipc.org/plants/inventory)
High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Moderate – These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Observed Wildlife, Euismod BESS Site, Kern County, CA. April 18, 2023.

Scientific name	Common name
INSECTA	**INSECTS**
Hymenoptera	**Ants, Bees, and Wasps**
Formicidae	**Ants**
Pogonomyrmex californicus	California harvester ant
Lepidoptera	**Butterflies and Moths**
Nymphalidae	Brush-footed Butterflies
Vanessa cardui	Painted Lady
AVES	**BIRDS**
Accipitridae	**Raptors**
Buteo jamaicensis	Red-tailed hawk
Tyrannidae	**Tyrant flycatchers**
Myiarchus cinerascens	Ash-throated flycatcher
Laniidae	**Shrikes**
Lanius ludovicianus^	Loggerhead shrike
Corvidae	**Jays and crows**
Corvus corax	Common raven
Mimidae	**Mockingbirds and thrashers**
Mimus polyglottis	Northern mockingbird
Sturnidae	**Starlings**
*Sturnus vulgaris**	European starling
Emberizidae	**Towhees and sparrows**
Zonotrichia leucophrys	White-crowned sparrow
MAMMALIA	**MAMMALS**
Heteromyidae	**Pocket mice, kangaroo rats**
Dipodomys sp.	Kangaroo rat (burrows)
Canidae	**Dogs/wolves/foxes**
Canis latrans	Coyote (scat, tracks, voice)

^ CDFW Species of Special Concern
* Non-native species

Appendix C

CNDDB Query

CNDDB Query Results, 3-mile Radius, Aypa Euismod Site, Kern County, CA, October 25, 2022.

Common Name	Scientific Name	Presence	Element Date
burrowing owl	*Athene cunicularia*	Presumed Extant	20070911
burrowing owl	*Athene cunicularia*	Presumed Extant	20070911
burrowing owl	*Athene cunicularia*	Presumed Extant	20110302
burrowing owl	*Athene cunicularia*	Presumed Extant	20110304
desert tortoise	*Gopherus agassizii*	Presumed Extant	20100528
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110330
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110329
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110222
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110214
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110126
ferruginous hawk	*Buteo regalis*	Presumed Extant	20110322
Le Conte's thrasher	*Toxostoma lecontei*	Presumed Extant	19680921
loggerhead shrike	*Lanius ludovicianus*	Presumed Extant	20110121
loggerhead shrike	*Lanius ludovicianus*	Presumed Extant	20110121
loggerhead shrike	*Lanius ludovicianus*	Presumed Extant	20110301
long-eared owl	*Asio otus*	Extirpated	20110523
merlin	*Falco columbarius*	Presumed Extant	20101209
mountain plover	*Charadrius montanus*	Presumed Extant	20051111
mountain plover	*Charadrius montanus*	Presumed Extant	20110312
Northern California legless lizard	*Anniella pulchra*	Presumed Extant	20051123
Northern California legless lizard	*Anniella pulchra*	Presumed Extant	20190528
Northern California legless lizard	*Anniella pulchra*	Presumed Extant	20110214
prairie falcon	*Falco mexicanus*	Presumed Extant	1977XXXX
San Joaquin pocket mouse	*Perognathus inornatus*	Presumed Extant	20100606
Swainson's hawk	*Buteo swainsoni*	Presumed Extant	20200626
Swainson's hawk	*Buteo swainsoni*	Presumed Extant	20210617
Tulare grasshopper mouse	*Onychomys torridus tularensis*	Presumed Extant	20110530

Appendix D

IPaC Query

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Kern County, California



Local office

Carlsbad Fish And Wildlife Office

(760) 431-9440
(760) 431-5901

2177 Salk Avenue - Suite 250

Carlsbad, CA 92008-7385

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

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2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
California Condor Gymnogyps californianus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/8193	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

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Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

NAME	BREEDING SEASON
Costa's Hummingbird Calypte costae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9470	Breeds Jan 15 to Jun 10
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31

Tricolored Blackbird *Agelaius tricolor* Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

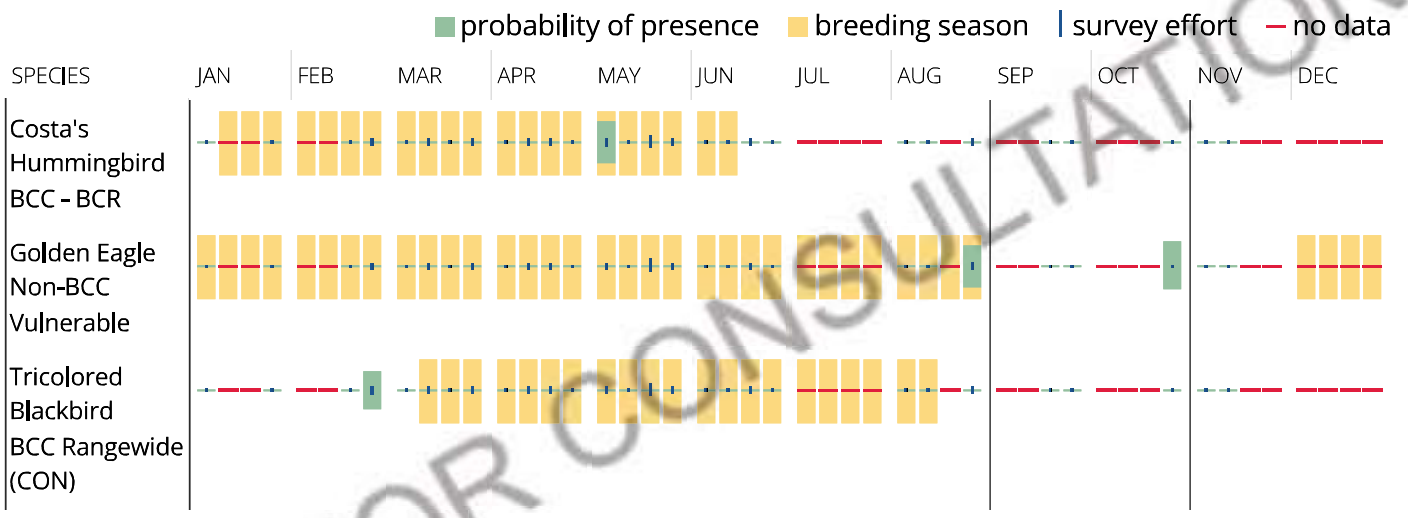
NOT FOR CONSULTATION

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid

cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

NOT FOR CONSULTATION

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Coastal Barrier Resources System

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

There are no known coastal barriers at this location.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

NOT FOR CONSULTATION

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

RIVERINE

Riverine

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

NOT FOR CONSULTATION

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Biological Resources Assessment (2024)

Biological Resources Assessment

Euismod Site
Kern County, CA

March 2024 Rev.0

Prepared For:

Euismod Project LLC
11801 Domain Boulevard, Suite 450 Austin, TX 78758

Prepared By:

TRC
6 Executive Circle, Suite 200 Irvine, CA 92614

Prepared by: Tanessa Hartwig, Senior Biologist and Sydnee Dunn, Biologist

Reviewed and approved by: Lucy Lin, Environmental Project Manager

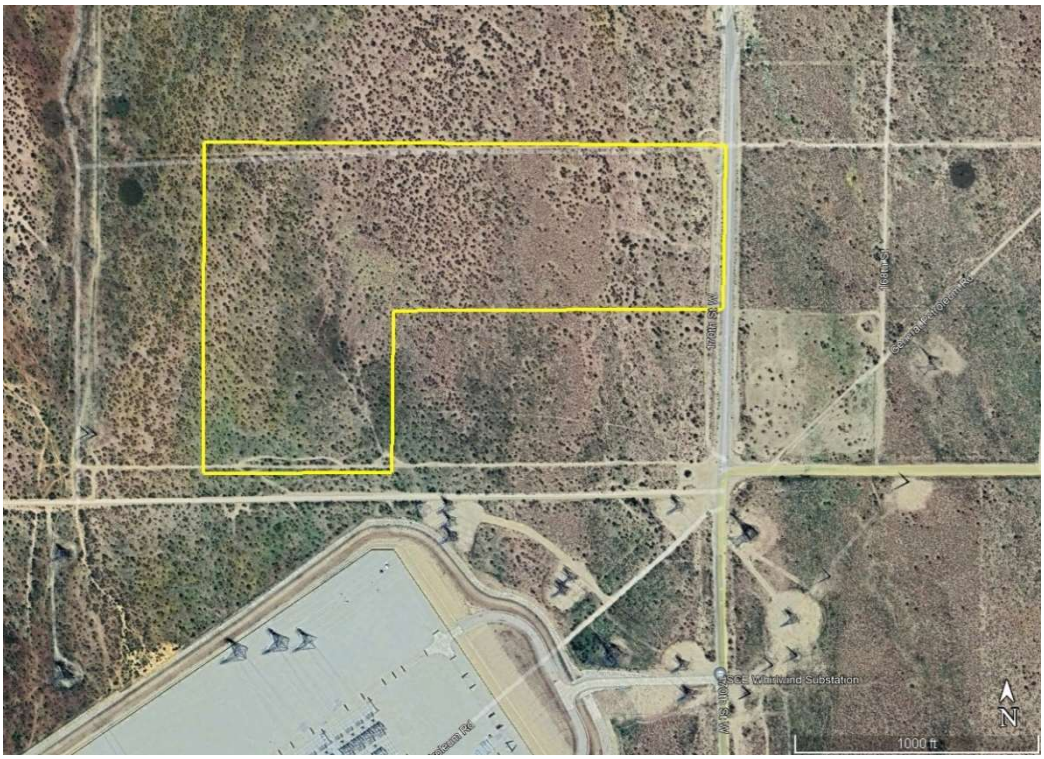


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Executive Summary

In February 2024, TRC Solutions, Inc. biologists performed a biological resources survey of an approximately 40-acre parcel planned for development of the Euismod Project, plus a surrounding 150-meter buffer, and additional lands that could be impacted by the Project's high voltage electric tie-line. The work included a preparatory desktop review to identify sensitive biological resources that could potentially be present, field survey, and preparation of this report. The field survey was conducted by walking meandering east-west transects within the survey area, searching for animal sign in the form of whitewash, feathers, burrows, scat, tracks, vocalizations, etc., and observing and recording observations of animal sign, plant species, and vegetation communities. Creosote bush scrub was the only vegetation community observed in the surveyed area. Joshua trees were observed through about 2/3 of the survey area. One loggerhead shrike, a California Species of Special Concern, was observed within the 150-meter buffer area. Other than Joshua trees and loggerhead shrike, no individual or sign of special status species was observed in the survey area. A burrowing owl was spotted in flight approximately 1,200 meters to the south.

1.0 Introduction

Euismod Project LLC is proposing to develop a battery energy storage system (BESS) project on an approximately 40-acre site (Site) in eastern Kern County, California (Figure 1). The Site is located in Section 14 of Township 9 North, Range 15 West, San Bernardino Principal Meridian (Figure 2). The Assessor's Parcel No. is 261-104-10. At the time of the work described in this report, the Site consisted of primarily undeveloped desert terrain and unpaved roads.

The batteries would be contained in outdoor enclosures. The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Whirlwind 230 kV substation located approximately 100 meters to the south.

This Biological Resources Assessment documents the methodologies and results of a desktop review and field survey of the proposed Site and adjacent lands within approximately 150 meters of the Site, referred to herein as the 150-meter Study Area. In addition, the adjacent land south of the Site, which encompasses the proposed tie-line perimeter, will be referred to herein as the Tie-line Study Area. Together, these two areas comprise the total Study Area. The purpose of the biological resources review and field survey was to evaluate the potential for presence of special status species or protected habitats on the site or adjacent lands.

1.1 Purpose and Scope

The purpose of this Biological Resources Assessment is to document the biological resources desktop review and field survey methodologies and results. Goals of the work included:

- Determine plant and animal species that are known to occur on and adjacent to the Site.
- Ascertain the presence or likely presence of state or federal special status species.
- Determine the presence of other significant biological elements, habitats, corridors, or communities.

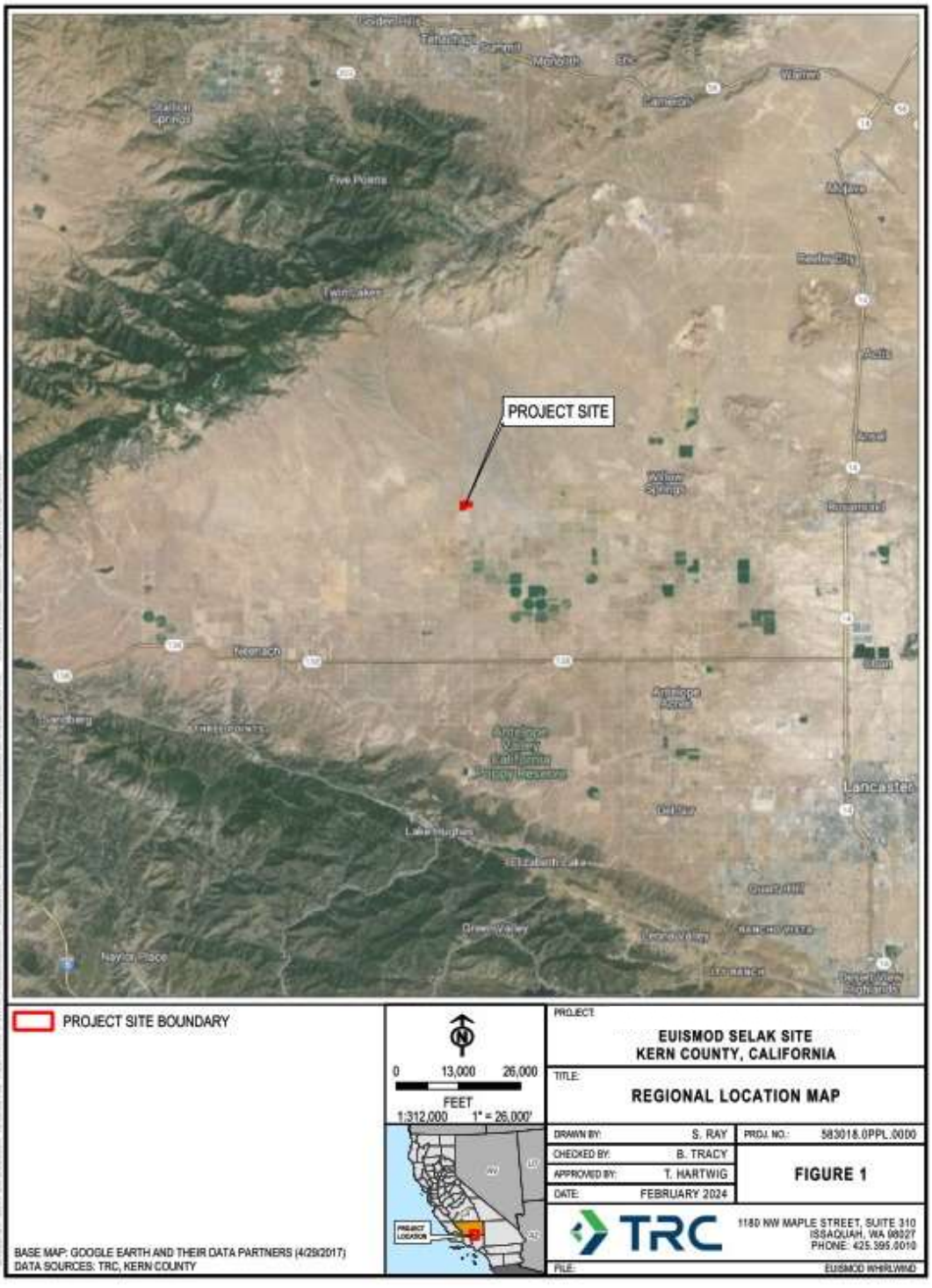


Figure 1: Project Location

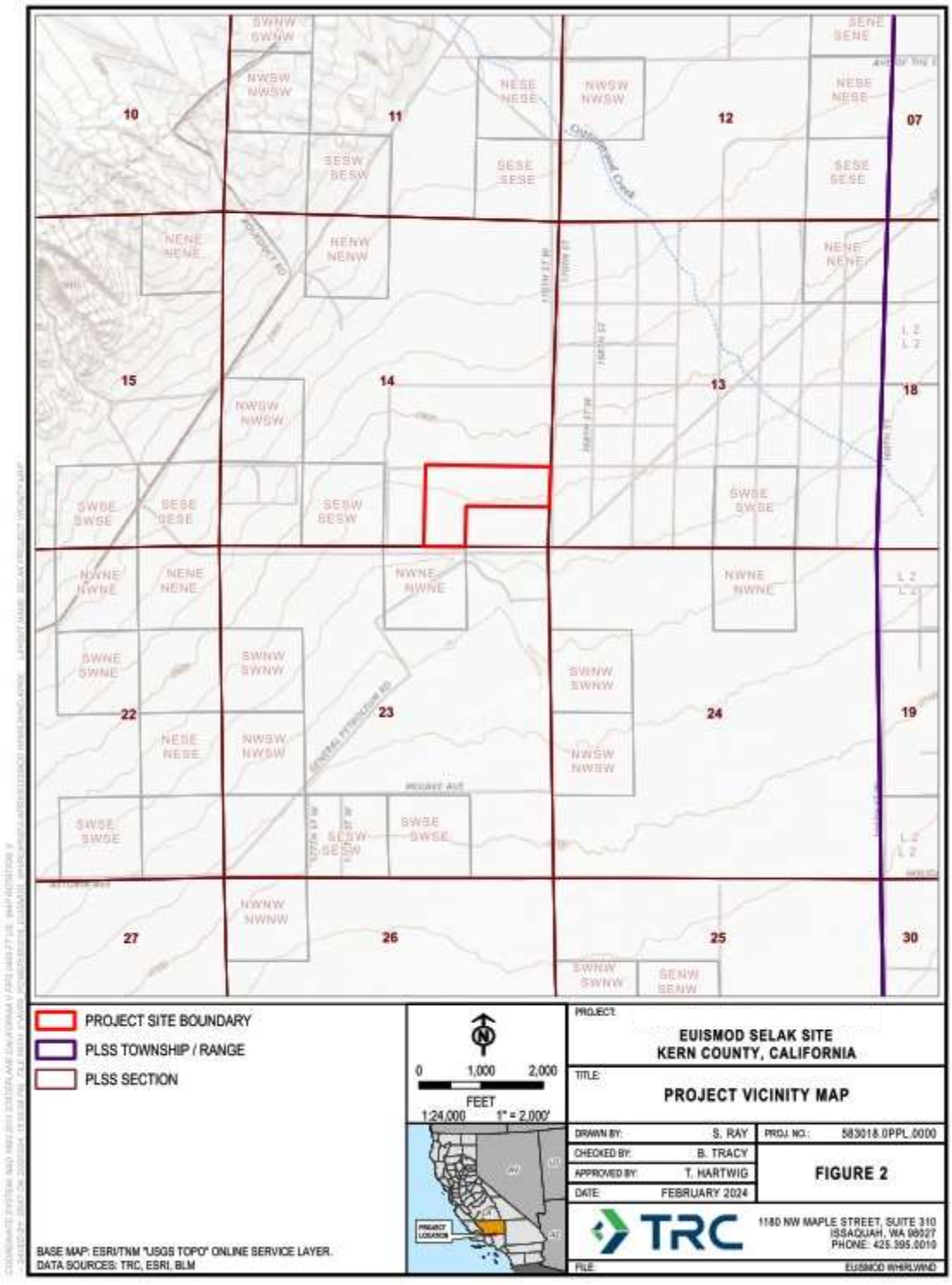


Figure 2: Project Vicinity Aerial Map

1.2 Setting

The proposed Site is an approximately 40-acre parcel about 15 miles west of Rosamond, CA (Figure 1). The parcel is situated about 0.4 mile to the north of the Southern California Edison (SCE) Whirlwind Substation. Along its southern boundary the parcel includes a portion of an unpaved road that extends west from Rosamond Blvd. The Site lies within the western Mojave Desert in the shadow of the Tehachapi Mountains to the northwest. There is an existing wind energy generation facility to the northeast. South of the Site, patches of native desert community intermingle with solar panels, agriculture, residential areas, and disturbed (ruderal) land. Figure 3 provides an aerial view of the 150-meter Study Area and Tie-line Study Area limits.

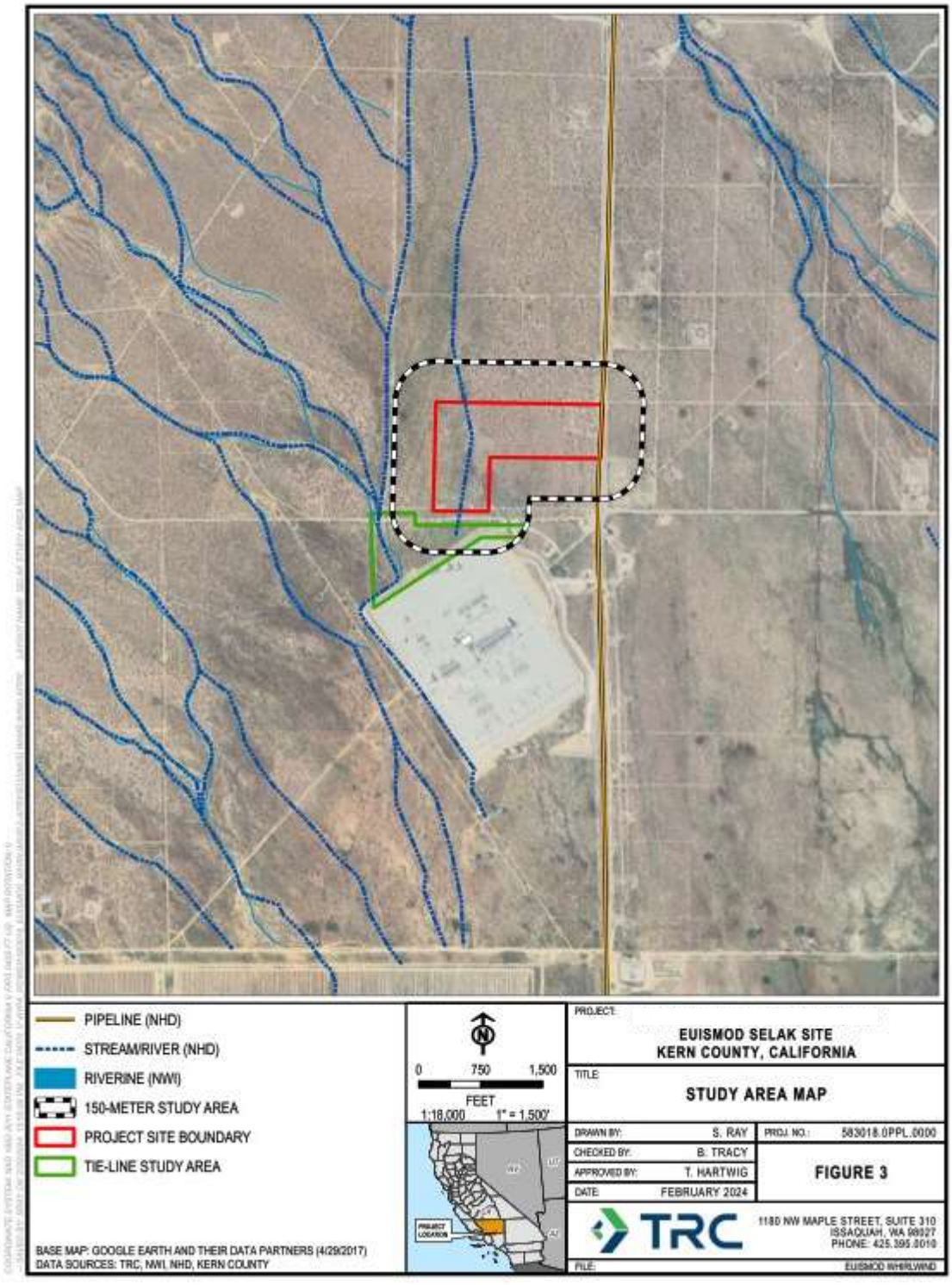


Figure 3. Study Area

2.0 Regulatory Requirements

2.1 Federal Regulations

2.1.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires federal agencies to review the effects that their actions would have on the environment prior to taking action. It requires all federal agencies to consider the direct, indirect, and cumulative effects of proposed actions and reasonable alternatives prior to making a decision. NEPA requires that all federal actions that could result in a significant effect on the environment to be subject to review by federal agencies with discretion over the action. If the Project requires any federal permits, NEPA may apply.

2.1.2 Federal Endangered Species Act (ESA)

The Endangered Species Act of 1973 (ESA) protects plants and animals that are listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Section 9 of ESA prohibits the taking of endangered wildlife, where taking is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct” (50 Code of Federal Regulations [CFR] 17.3). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any endangered plant on federal land and removing, cutting, digging up, damaging, or destroying any endangered plant on nonfederal land in knowing violation of state law (16 USC 1538). Under Section 7 of ESA, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect a listed (or proposed) species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion, the USFWS may issue an incidental take statement allowing take of the species that is incidental to an otherwise authorized activity provided the activity will not jeopardize the continued existence of the species. Section 10 of ESA provides for issuance of incidental take permits provided a habitat conservation plan is developed.

2.1.3 Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (MBTA) implements international treaties between the United States and other nations devised to protect migratory birds, any of their parts, eggs, and nests from activities such as hunting, pursuing, capturing, killing, selling, and shipping, unless expressly authorized in the regulations or by permit. As authorized by the MBTA, the USFWS issues permits to qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, special purposes (rehabilitation, education, migratory game bird propagation, and salvage), take of depredating birds, taxidermy, and waterfowl sale and disposal. The regulations governing migratory bird permits can be found in 50 CFR part 13 General Permit Procedures and 50 CFR part 21 Migratory Bird Permits.

On December 22, 2017, the U.S. Department of the Interior (DOI) issued Memorandum M-37050, which states that “the statute's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs.” In other words, the MBTA incidental take allowance has been legally modified and excludes avian impacts during lawful construction activities, when the intended purpose of such activities does not include impacting birds. The USFWS codified this memorandum into a final rule in 2020 (USFWS 2020). In 2021,

the USFWS revoked its 2020 rule and returned to implementing the MBTA consistent with judicial precedent and agency practice prior to 2017 (USFWS 2021).

2.1.4 The Bald and Golden Eagle Protection Act (BGEPA)

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the taking or possession of and commerce in bald and golden eagles with very limited exceptions. Under the BGEPA, it is a violation to "take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or any manner, any bald eagle commonly known as the American eagle, or golden eagle, alive or dead, or any part, nest, or egg, thereof." Take is defined to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, and disturb.

2.2 State Regulations

2.2.1 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires State and local agencies to review the effects of their actions on the environment prior to acting on a project unless exempted. It requires that significant environmental impacts, including significant impacts to biological resources, be mitigated to a level that is less than significant, or to the maximum extent practical if the significant impact cannot be mitigated to a level that is less than significant. CEQA is codified in California Public Resources Code Section 21000 *et seq.* and supporting environmental review guidelines are codified in California Code of Regulations Title 14 Section 15000 *et seq*.

2.2.2 California Fish and Game Code

2.2.2.1 California Endangered Species Act (CESA)

The California Endangered Species Act (CESA) generally parallels the main provisions of the ESA, but unlike its federal counterpart, CESA applies the take prohibitions to species proposed for listing (called "candidates" by the state). Section 2080 of the California Fish and Game Code prohibits the taking, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or in the regulations. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects. State lead agencies are required to consult with California Department of Fish and Wildlife (CDFW) to ensure that any action they undertake is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat.

2.2.2.2 Fully Protected Species

The state of California first began to designate species as "fully protected" prior to the creation of the CESA and ESA. Lists of fully protected species were initially developed to provide protection to those animals that were rare or faced possible extinction, and included fish, amphibians and reptiles, birds, and mammals. Most fully protected species have since been listed as threatened or endangered under CESA and/or ESA. The regulations that implement the Fully Protected Species Statute (Fish and Game Code Section 4700) provide that fully protected species may not be taken or possessed at any time. Furthermore, no licenses or permits may be issued for incidental take except for collection of these species for necessary scientific research, relocation of the bird species for the protection of livestock, or if the species is a covered species under a Natural Community Conservation Plan (NCCP).

2.2.2.3 Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 (Fish and Game Code Sections 1900-1913) was created with the intent to “preserve, protect and enhance rare and endangered plants in this state.” The NPPA is administered by CDFW. The Fish and Wildlife Commission has the authority to designate native plants as “endangered” or “rare” and to protect endangered and rare plants from take. The CESA of 1984 (Fish and Game Code Section 2050-2116) provided further protection for rare and endangered plant species, but the NPPA remains part of the Fish and Game Code.

2.2.2.4 Streambed Alteration Agreement

Section 1602 of the Fish and Game Code requires that a Streambed Alteration Application be submitted to CDFW for “any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake.” The CDFW reviews the proposed actions and, if necessary, submits to the Applicant a proposal for measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by CDFW and the Applicant is the Streambed Alteration Agreement.

2.2.2.5 Migratory Birds

CDFW enforces the protection of non-game native songbirds and raptors. These protections are outlined in Sections 3503, 3503.5, and 3800 of the Fish and Game Code. Furthermore, Section 3513 of the Fish and Game Code prohibits the possession or take of birds listed under the federal MBTA. These sections mandate the protection of California non-game native birds’ nests and also make it unlawful to take these birds.

3.0 Methods

3.1 Desktop Review

Prior to conducting the field survey, TRC biologists performed a desktop review to determine the special status species and habitats that have been documented in the project vicinity and their habitat needs compared to habitat characteristics of the proposed Site and adjacent lands. Desktop review included information gathered from the following sources:

- USFWS Information for Planning and Consultation (IPaC) online tool
- California Natural Diversity Data Base (CNDDB)
- California Native Plant Society (CNPS) Inventory of Rare Plants
- Google Earth aerial imagery
- US Geological Survey (USGS), The National Map (TNM) Online Topographic Map
- Natural Resources Conservation Service (NRCS) Web Soil Survey
- USFWS Wetland Mapper, National Wetlands Inventory (NWI) online map
- CDFW Biogeographic Data Branch, California Wildlife Habitat Relationship System, (Version 10.1.27) online tool
- Jepson eFlora Project (eds.)
- Calflora Database

Based on the desktop review, a list of special status plant and wildlife species with potential to occur in the Study Area was generated. For the purposes of this evaluation, special status species are defined as plants or wildlife that:

- Have been designated as either species of special concern, threatened, endangered, or fully protected by USFWS or the State of California;
- Are candidate species being considered or proposed for listing under the ESA or CESA;
- Are designated as sensitive by the California Native Plant Society (CNPS).

The habitat preferences and distributional range of each species from the database queries were evaluated first by desktop assessment for potential occurrence in the proposed Site or its vicinity. For wildlife, “vicinity” is defined by species, based on each species’ movement ecology; hence, species with more wide-ranging movement patterns will have larger vicinities. For plants, “vicinity” is defined by the 9-quad search area, excluding those habitats clearly unlike the Study Area (e.g., high mountain ranges if the Study Area is low elevation desert). After the field visit, sensitive species were assessed for potential to occur within the Study Area based on the following guidelines:

Present: Species has been observed in the Study Area during field surveys or recorded in the Study Area in the recent past.

High: All or many of the habitat elements meeting the species' requirements are present and/or the species has been recorded in the vicinity of the Study Area. The species has a high probability of residing in the Study Area or occurring in the Study Area on a regular basis.

Moderate: Some of the habitat elements meeting the species' requirements are present and/or the species has been recorded in the vicinity of the Study Area. The species has a moderate probability of occurring in the Study Area on a regular basis or residing in the Study Area.

Low: Few of the habitat elements meeting the species' requirements are present, and/or habitat elements present are sub-marginal. Species has been recorded in the vicinity of the Study Area. The species has a low probability of occurring in the Study Area on a regular basis or residing in the Study Area but may occur as a transient.

Presumed Absent: Species not observed in the Study Area or its vicinity in the recent past and habitat in the Study Area does not meet species' requirements.

3.2 Biological Survey

TRC biologists Tanessa Hartwig and Sydnee Dunn conducted a biological resource survey of the Study Area on February 2, 2024. The biologists walked meandering east-west transects within the Study Area, visually scanning the landscape and listening for wildlife activity, including bird songs and calls as well as animal "rustles." Binoculars and a 10x magnifier were used as necessary to identify wildlife and plants. The survey included the following:

- Recording plant and animal species observed;
- Observing for the possible presence of special status species;
- Evaluating habitat for special status species;
- Characterizing vegetation communities and land cover types;
- Searching for animal sign in the form of whitewash, feathers, burrows, scat, tracks, vocalizations, etc.;
- Taking photographs of the site; and
- Recording weather data.

Vegetation was identified using a dichotomous key (Baldwin et al. 2002) or field guides (e.g., Rundel et al. 2022). Vegetation nomenclature is after the Jepson eFlora (2024). Wildlife nomenclature was developed from California Natural Diversity Database (CDFW 2024), USFWS IPaC website (USFWS 2024a), and taxon-specific field guides or websites.

Representative photographs are provided in Appendix A. Lists of plant and animal species observed or detected during the field survey are provided in Appendix B.

4.0 Results

Results of the desktop review and field survey are described in the following sections, including area characteristics, vegetation communities, plants, wildlife, special status species, and sensitive natural communities. Figure 4 provides a visual description of special status species observations and potential jurisdictional resources observed. Weather conditions during the survey are noted in Table 1. Weather was recorded using a Kestrel 2000. Temperatures were recorded at waist height in the shade of the biologist.

Table 1: Survey Date, Times, and Conditions

Type of Survey	Date	Time	Temperature (˚F)	Cloud Cover (%)	Wind Speed (mph)
Pedestrian	February 2, 2024	8:15 a.m.	45.2	45	1-4.8

4.1 Biological Study Area Characteristics

4.1.1 Physiographic Setting

The Study Area is located on alluvial slopes on the south side of the Tehachapi Mountain range at elevations of approximately 2761 to 2792 feet above mean sea level. The ground surface slopes gently to moderately in a northwest-southeast direction. The soils are sandy loams. Soil types within the Site as mapped by National Resources Conservation Services (NCRS) are shown in Table 2 (USDA 2024).

Table 2: Soil Types in the proposed Site

Soil Type	Abbreviation	Approx. % of Environmental Study Area
Cajon loamy sand, 2 to 9 percent slopes	CaC	6.7
Hesperia fine sandy loam, 2 to 5 percent slopes	HkB	92.9
Rosamond fine sandy loam	Ro	0.4

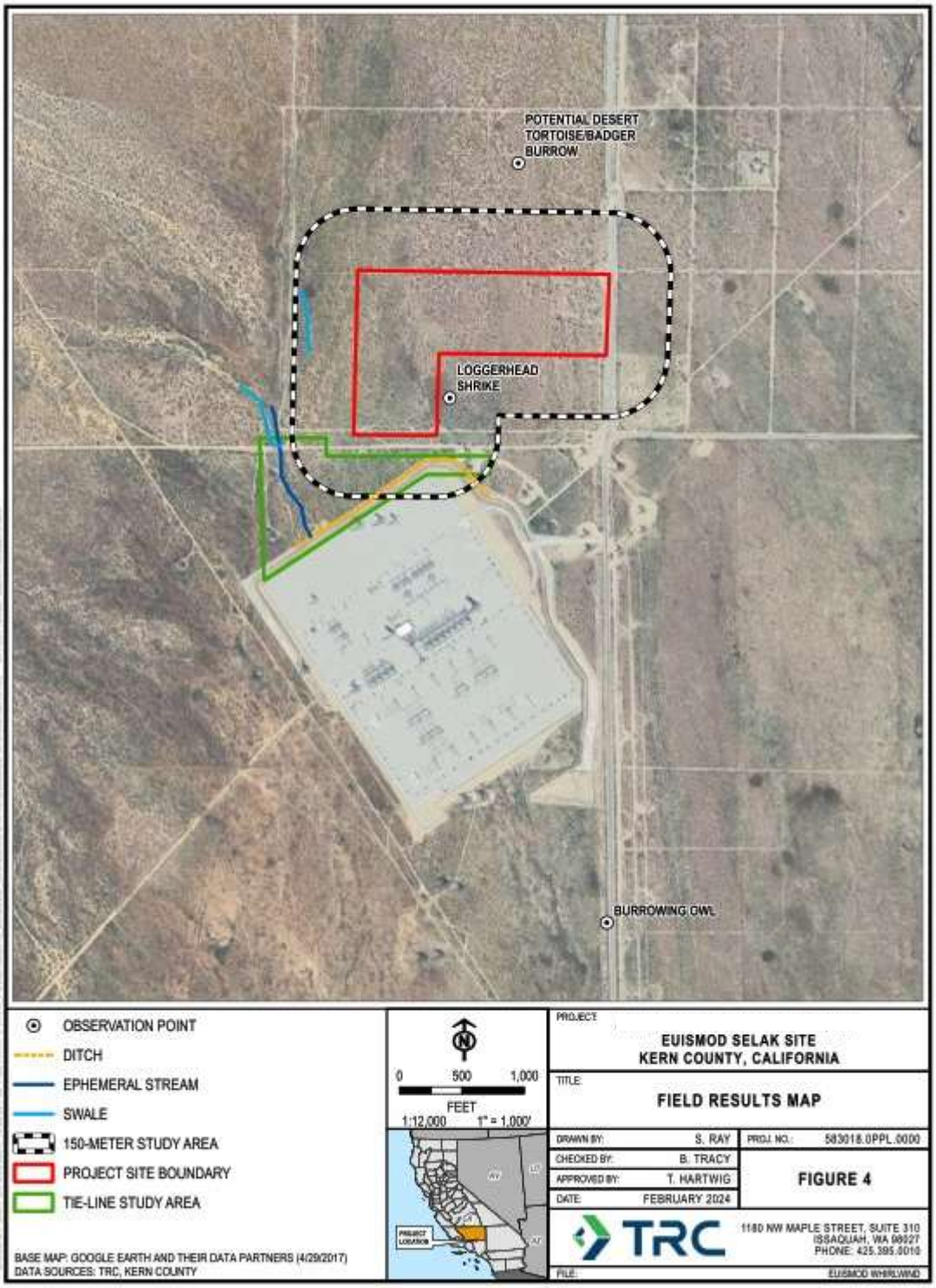


Figure 3: Results of Field Survey

4.1.2 Vegetation Communities and Plants

Creosote Bush Scrub (*Larrea tridentata* Shrubland Alliance)

Vegetation communities in the Study Area were mapped as creosote bush (*Larrea tridentata*) scrub alliance by the Desert Renewable Energy Conservation Plan (Menke et al. 2016), with Joshua tree (*Yucca brevifolia*) cover estimated to be 0 – 1% of the total ground cover. The field survey confirmed that the Study Area is creosote bush scrub. Based on the lack of a central stem in most plants, the dominance of creosote, and the presence of well-spaced creosote "circles," the community appeared to be a mature creosote scrub community. Joshua tree cover averaged about 2% through approximately 2/3 of the Site. Creosote bush scrub was the only vegetation community observed in the Study Area and on the Site.

Creosote bush scrub is characterized as an open shrub community with creosote dominant or co-dominant in the shrub canopy (Sawyer et al. 2009). Other shrubs that co-occur may include: Shockley's goldenhead (*Acamptopappus shockleyi*), rayless goldenhead (*Acamptopappus sphaerocephalus*), white bursage (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), spiny saltbush (*Atriplex confertifolia*), desert holly (*Atriplex hymenelytra*), allscale saltbush (*Atriplex polycarpa*), woolly brickellia (*Brickellia incana*), brittlebush (*Encelia farinosa*), California ephedra (*Ephedra californica*), Nevada ephedra (*Ephedra nevadensis*) and Anderson wolfberry (*Lycium andersonii*). Emergent trees may be present at low cover, including honey mesquite (*Prosopis glandulosa*) or Joshua tree (*Yucca brevifolia*). The herbaceous layer is composed of seasonal annuals or perennial grasses. Aerial cover by the shrub layer and herb layer varies from open to intermittent.

The creosote bush scrub community in the Study Area was dominated by creosote. The shrub community was open; shrubs were typically spaced 4 to 20 feet apart. Other shrubs observed within the Study Area included: ephedra (*Ephedra* sp.), rubber rabbitbrush (*Ericameria nauseosa), Cooper's goldenbush (Ericameria cooperi*), winterfat (*Krascheninnikovia lanata*) buckwheat (*Eriogonum* sp.), and silver cholla (*Cylindropuntia echinocarpa*). Native herbs included: pale yellow sun cup (*Camissoniopsis pallida*), valley vinegar weed (*Lessingia glandulifera*), devil's lettuce (*Amsinckia tesselata),* and anglestem buckwheat (*Eriogonum angulosum*). Non-native herbs and grasses were also present, and included tumble mustard (*Sisymbrium altissimum*), redstem filaree (*Erodium cicutarium*), and sand rice grass (*Stipa hymenoides)*. The herb layer was very dense under shrub canopies. Appendix B provides a list of vascular plant species observed during the site visit.

4.1.3 Aquatic Resources

The National Hydrography Dataset (NHD) and National Wetland Inventory (NWI) maps identified an intermittent stream bisecting the western portion of the Site, as well as an ephemeral stream running north to south along the western border of the Tie-line Study Area (Figure 3; USGS 2024; USFWS 2024b). The field visit did not identify any streams or other aquatic resources within the Site but did confirm the ephemeral stream running along the western boundary of the Tie-line Study Area (Figure 4). The ephemeral stream has the characteristics of a jurisdictional resource (e.g., bed and bank, ordinary high-water mark, change in substrate); therefore, the stream may be a "water of the state" subject to jurisdiction of the Lahontan Regional Water Quality Control Board (RWQCB) and/or the California Department of Fish and Wildlife (CDFW). In addition, two swales were observed within the Study Area. The swales did not exhibit jurisdictional characteristics. This watershed is internally

drained and considered isolated by the USACE. Therefore, aquatic resources within the Study Area are not likely to be federally jurisdictional.

4.1.4 Migration Pathway, Wildlife Movement Corridor, Linkages

Linkages and corridors facilitate regional animal movement and can consist of features such as waterways, riparian corridors, mountain passes, contiguous habitat, and other physical features. The habitat surrounding the Site consists of open space to the north, east, and west; there is ample room for wildlife movement throughout the area and no unique corridor in the Study Area. The ephemeral stream in the Tie-line Study Area does not have densely vegetated riparian corridors and drains to a man-made ditch along the substation; therefore, it does not provide high quality corridor habitat.

4.2 Wildlife

Most wildlife observed or detected during the survey were native birds and small mammals. These included: common raven (*Corvus corax*), loggerhead shrike (CDFW species of special concern; *Lanius ludovicianus*), red-tailed hawk *(Buteo jamaicensis)*, white-crowned sparrow (*Zonotrichia leucophrys*), and blue-gray gnatcatcher (*Polioptila caerula*). Coyote (*Canis latrans*) scat was observed in the surrounding area. In addition, burrowing owl (*Athene cunicularia;* CDFW species of special concern) was observed about 1200 meters south of the Study Area flying west across 170th Street (Figure 4).

There were many small mammal burrows within the 150-meter Study Area, and fewer in the Tie-line Study Area. Observed burrows ranged from about 3.8 centimeters (cm) by 2.5 cm to 5 cm by 5 cm and most were circular to oval in shape. One of the larger burrows observed was 6.4 cm by 5 cm. A few burrows had signs of tail drag at the burrow or foraging diggings nearby, indicating potential use by kangaroo rat (*Dipodomys* sp.) and/or antelope squirrel (*Ammospermophilus leucurus*). Based on the size of the burrows and habitat, the most likely species of kangaroo rat within the 150-meter Study Area is Merriam's kangaroo rat (*Dipodomys merriami*). Appendix A, Photo 10 provides a representative photo of a small mammal burrow. Other species that may use or borrow burrows of this size include lizards and snakes, grasshopper mice (*Onchomys* sp.), juvenile desert tortoise (*Gopherus agassizii*), and certain ground squirrels (*Ammospermophilus* sp.). Burrowing owls may modify kangaroo rat burrows to suit their needs. Protocol surveys for desert tortoise and burrowing owl were not performed as part of this biological reconnaissance survey. However, observed burrows in the Study Area did not show signs of occupancy by burrowing owl or desert tortoise.

Outside of the Study Area and about 250 meters north of the Site, biologists observed an inactive desert tortoise or American badger (*Taxidea taxus*) burrow (Figure 4; Appendix A, Photo 10). The burrow was D-shaped, but collapsed inside, and had no signs of current use by desert tortoise (scat, tracks) or badger (fresh scrapings along sides). Large, dislodged chunks of soil indicated possible past badger use.

A list of wildlife species observed or identified by sign during the survey is included in Appendix B.

4.3 Sensitive Biological Resources

4.3.1 Special Status Habitats

No sensitive natural communities are present in the Study Area. Creosote bush scrub is a widespread native plant community in the Mojave Desert.

4.3.2 Special Status Plants

The potential for special status plant species to occur within the Study Area based on the desktop review and field assessment of habitat present is provided in Table 3. The species identified in Table 3 were compiled from a CNDDB 5-mile radius search (Appendix C), the online IPaC tool (Appendix D), and the CNPS list of rare plants. Table 3 addresses the special status plant species identified as having potential habitat present during the desktop review and thus having potential to occur in the Study Area, as described in the methods (Section 3.1).

Joshua tree (*Yucca brevifolia*), a Candidate for listing under the California Endangered Species Act, was observed at multiple locations throughout the Study Area. One (1) special status species, Clokey's cryptantha (*Cryptantha clokeyi*), was determined to have moderate potential to occur within the Study Area.

Table 3: Potential Special Status Plants

Species	Protection Status	Habitat Requirements	Potential To Occur*
alkali mariposa-lily (*Calochortus striatus*)	-- / -- / 1B.2	Chaparral; Chenopod scrub; Mojavean Desert scrub; Meadow & seep; Wetland - alkaline meadows and ephemeral washes. **Elevation:** 70-1600 m **Blooming period:** Apr-Jun	**Low:** Known to occur in the vicinity to the northeast. The majority of the site lacks potential for alkali soils needed to support this species; however, desert scrub habitat is present.
aparejo grass (*Muhlenbergia utilis*)	-- / -- / 2B.2	Chaparral; Cismontane woodland; Coastal scrub; Meadow & seep; Marsh & swamp; Ultramafic - sometimes alkaline, sometimes serpentinite. **Elevation:** 25-2325 m **Blooming period:** Apr-Jul	**Low**: The majority of the site lacks potential for alkali soils, and preferred habitats are not on Site. Known to occur in the foothills to the north.
Bakersfield cactus (*Opuntia basilaris* var. *treleasei*)	FE / SE / 1B.1	Chenopod scrub; Cismontane woodland; Valley & foothill grassland - coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats, within grassland. **Elevation:** 85-550 m **Blooming period:** Jan-Aug	**Low:** Well-drained granitic sandy loams on flats are located on site. However, preferred grassland or chenopod scrub habitats not observed on site and site is outside typical elevation range. Was not observed during the February survey.

Clokey's cryptantha (*Cryptantha clokeyi*)	-- / -- / 1B.2	Mojavean Desert scrub - sandy or gravelly soils. **Elevation:** 750-1890 m **Blooming period:** (Mar)Apr-Jul	**Moderate:** This species primarily occurs on rocky to gravelly slopes or ridge crests; however, it has also been observed on relatively flat areas with gravelly soils in desert scrub habitat, which occurs onsite. It is also known to grow in the mountains and foothills to the southeast.
Fort Tejon woolly sunflower (*Eriophyllum lanatum* var. *hallii*)	-- / -- / 1B.1	Chaparral; Cismontane woodland -often on slopes in loamy soils. **Elevation:** 1065-1435 m **Blooming period:** Feb-Apr(May)	**Presumed Absent:** Suitable habitat is not present on site and site is outside typical elevation, precipitation, and temperature range for this species. Was not observed during the February survey.
Greata's aster (*Symphyotrichum greatae*)	-- / -- / 1B.3	Broadleaved upland forest; Chaparral; Cismontane woodland; Lower montane coniferous forest; Riparian woodland - mesic canyons. **Elevation:** 335-2015 m **Blooming period:** Mar-May	**Low**: Suitable forest or woodland habitat is not present on Site and the Site is outside typical precipitation and temperature range for this species. Known to occur in the mountains and foothills south of the Site.
Horn's milk-vetch (*Astragalus hornii* var. *hornii*)	-- / -- / 1B.1	Alkali playa; Meadow & seep; Wetland - lake margins, alkaline sites. **Elevation:** 75-350 m **Blooming period:** Feb-Apr	**Presumed Absent:** Site is outside of the elevation range typical for this species and does not contain the salty flats or lake shore habitat preferred. Was not observed during the February survey.
Joshua tree (*Yucca brevifolia*)	-- / SC / --	Desert flats, slopes; Pollinated by the yucca moth *Tegeticula synthetica*. **Elevation:** 400--2300 m **Blooming period:** Mar-May	**Present:** Occurs throughout the Site and surrounding Study Areas. Density varies, but overall coverage is about 1% within the Site.
madera leptosiphon (*Leptosiphon serrulatus*)	-- / -- / 1B.2	Cismontane woodland; Lower montane coniferous forest - dry slopes; often on decomposed granite in woodland. **Elevation:** 80-1645 m **Blooming period:** Jul-Aug	**Low:** Suitable Cismontane woodland or lower montane coniferous forest habitat is not present on Site. Known to primarily occur in the mountains and foothills to the north of the Site where woodlands are present. The Site also lacks significant slopes.

Peirson's lupine (*Lupinus peirsonii*)	-- / -- / 1B.3	Joshua tree woodland; Lower montane coniferous forest; Pinon & juniper woodlands; Upper montane coniferous forest - decomposed granite slide and talus, on slopes and ridges. **Elevation:** 1400-2380 m **Blooming period:** Apr-Jun	**Low:** Suitable habitat is not present on Site. The Site also occurs outside of the typical elevation range and lacks significant slopes preferred by this species.
Robbins' nemacladus (*Nemacladus secundiflorus* var. *robbinsii*)	-- / -- / 1B.2	Chaparral; Valley & foothill grassland - dry, sandy, or gravelly slopes. openings. **Elevation:** 360-1710 m **Blooming period:** May-Jul	**Low:** Site contains suitable soils but lacks suitable vegetation communities.
salt spring checkerbloom (*Sidalcea neomexicana*)	-- / -- / 2B.2	Alkali playa; Chaparral; Coastal scrub; Lower montane coniferous forest; Mojavean Desert scrub; Wetland - alkali springs and marshes. **Elevation:** 3-2380 m **Blooming period:** Sep-May	**Low:** Site does not contain alkali springs or marsh habitat, prefers mesic habitats. However, desert scrub habitat does occur onsite.
San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*)	-- / SE / 1B.1	Coastal scrub; Valley & foothill grassland - sandy soils. **Elevation:** 15-1015 m **Blooming period:** Jun-Sep	**Low:** Soils on Site are finer than what is typical, as sandy coastal scrub habitat is preferred. Not known to occur north of Los Angeles County.
short-joint beavertail (*Opuntia basilaris* var. *brachyclada*)	-- / -- / 1B.2	Chaparral; Joshua tree woodland; Mojavean Desert scrub; Pinon & juniper woodlands – sandy soil or coarse, granitic loam. **Elevation:** 425-2015 m **Blooming period:** Apr-Jun (Aug)	**Low:** Soil in the Site area is finer than the preferred soil texture. Not known to occur outside of Los Angeles and San Bernardino Counties.
slender mariposa-lily (*Calochortus clavatus* var. *gracilis*)	-- / -- / 1B.2	Chaparral; Coastal scrub; Valley & foothill grassland – shaded foothill canyons; often on grassy slopes within other habitat. **Elevation:** 210-1815 m **Blooming period:** Mar-Jun (Nov)	**Low:** The Site does not contain much shade or reside in the foothills or on grassy slopes habitat preferred.

southern jewelflower (*Streptanthus campestris*)	-- / -- / 1B.3	Chaparral; Lower montane coniferous forest; Pinon & juniper woodlands – open, rocky areas. **Elevation:** 605-2590 m **Blooming period:** (Apr) May-Jul	**Low:** The Site does not contain rocky substrate, nor does it contain the preferred habitat; coniferous or pinon & juniper woodlands.
spreading navarretia (*Navarretia fossalis*)	FT / -- / 1B.1	Alkali playa; Chenopod scrub; Marsh & swamp; Vernal pool; Wetland - San Diego hardpan and San Diego claypan vernal pools; in swales & vernal pools, often surrounded by other habitat types. **Elevation:** 15-850 m **Blooming period:** Apr-Jun	**Low:** The Site does not contain alkali/claypan soils, nor does it contain any vernal pools or wetlands.
southern Sierra monardella (*Monardella linoides* ssp. *anem onoides*)	-- / -- / 1B.3	Chaparral; Cismontane woodland; Lower montane coniferous forest - occurs usually in non-wetlands, occasionally in wetlands (low water tolerant). **Elevation:** 750-2000 m **Blooming period:** Jun-Aug	**Low:** Chaparral, Cismontane woodland, and lower montane coniferous forest do not occur in the Site. Average temperatures and lows, mean precipitation, and soil pH are not within this species' typical range onsite. However, this species is known to occur along the foothills to the north of the Site.
Tehachapi monardella (*Monardella linoides* ssp. *oblonga*)	-- / -- / 1B.3	Lower montane coniferous forest; Pinon & juniper woodlands; Upper montane coniferous forest - on dry slopes of yellow pine forest, decomposed granitic soils; also, in roadside disturbed areas. **Elevation:** 1430-2655 m **Blooming period:** (May) Jun-Aug	**Low:** The Site does not contain coniferous forest, Pinon & juniper woodlands, or yellow pine forests. The Site is also outside of the elevation range needed to support this plant species.
Tejon poppy (*Eschscholzia lemmonii* ssp. *kernensis*)	-- / -- / 1B.1	Chenopod scrub; Valley & foothill grassland - little information available on habitat. **Elevation:** 135-1355 m **Blooming period:** (Feb) Mar-May	**Low:** Tends to prefer calcareous soils, which are not contained in the Site. Known sightings have occurred in the foothills to the northwest. However, open areas on site may provide some habitat. Was not observed during the February survey.

Status Designations	California Rare Plant Rank (CRPR)
Federal	1A Plant assumed extinct in California
FE Listed as Endangered under the federal Endangered Species Act	1B Plants rare, threatened, or endangered in California and elsewhere
FT Listed as Threatened under the federal Endangered Species Act	2 Plants rare, threatened, or endangered in California, but more common elsewhere
	Threat Ranks
State of California	0.1-Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
SE California Fish and Game Code Endangered Species	0.2-Fairly threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
ST California Fish and Game Code Threatened Species	0.3-Not very threatened in California (<20% of occurrences threatened/low degree and
SC California Fish and Game Code Candidate Species	immediacy of threat or no current threats known)
FP California Fish and Game Code Fully Protected Species	
SR California Fish and Game Code Rare Species	
SSC California Department of Fish and Wildlife Species of Special Concern	

*Habitat information from: www.calflora.org (Calflora 2024) and https://ucjeps.berkeley.edu/eflora/ (Jepson 2024).

4.3.3 Special Status Wildlife

The potential for special status wildlife species to occur on or adjacent to the proposed Study Area and Tie-line Study Area are based on the desktop review and field survey is provided in Table 4. The species identified in Table 4 were compiled from a CNDDB 5-mile radius search (Appendix C) and the online IPaC tool (Appendix D). Table 4 addresses wildlife species of special concern identified as having habitat present during the desktop review and field survey and thus being present, presumed absent, or having low, moderate, or high potential to occur, as described in the methods (Section 3.1).

A total of five (5) special status wildlife species were identified with high potential to be regionally present and have potential habitat in the Study Area. These five (5) wildlife species were either documented in the vicinity in the past or were determined to have a high potential to occur in the Study Area based on the presence of suitable habitat. One species, loggerhead shrike (*Lanius ludovicianus*; SSC), was detected by direct observation during the field survey and therefore determined present. In addition, a burrowing owl was observed 1200 meters south of the Site. A potential inactive desert tortoise or American badger burrow was observed 250 meters north of the Site. No other special status wildlife species or sign were observed during the survey (Table 4, Appendix B).

Table 4. Potential Special Status Wildlife

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
Reptiles			
Northern California legless lizard (*Anniella pulchra*)	-- / -- / SSC	Chaparral; Coastal dunes; Coastal scrub. Soil moisture is essential. They prefer soils with a high moisture content. Sandy or loose loamy soils under sparse vegetation.	**Moderate:** Sandy soils, sparse vegetation, and some ephemeral washes occur on Site. More likely to occur near washes or other areas where soils hold moisture. Known to occur in the vicinity, near the Whirlwind Substation (CNDDB).
desert tortoise (*Gopherus agassizii)*	FT / ST / --	Joshua tree woodland; Mojavean desert scrub; Sonoran Desert scrub. Require friable soil for burrow and nest construction. Creosote bush habitat with large annual wildflower blooms preferred. Most common in desert scrub, desert wash, and Joshua tree habitats; occurs in almost every desert habitat.	**High:** Suitable soil for burrowing and creosote/Joshua tree habitat are available on Site. A potential inactive desert tortoise burrow was observed north of the Study Area during the February survey.

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
southern rubber boa (*Charina umbratica*)	-- / ST / --	Meadow & seep; Riparian forest; Riparian woodland; Upper montane coniferous forest; Wetland. Found in vicinity of streams or wet meadows; requires loose, moist soil for burrowing; seeks cover in rotting logs, rock outcrops, and under surface litter. Known from the San Bernardino and San Jacinto mtns; found in a variety of montane forest habitats. Snakes resembling *C. umbratica* reported from mt. Pinos and Tehachapi mtns group with *C. bottae* based on mtdna. Further research needed.	**Low:** Site does not contain suitable habitat due to a general lack of moisture. Known to occur about 7 miles northwest of site (CNDDB).
Birds			
California condor (*Gymnogyps californianus*)	FE / SE / FP	Chaparral; Valley & foothill grassland. Deep canyons containing clefts in the rocky walls provide nesting sites. Forages up to 100 miles from roost/nest. Require vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude.	**Moderate:** (forage/transit) There is extensive predicted habitat throughout the mountain ranges surrounding the site to the north, west, and south (CDFW 2024b). The Site and Study Area do not contain any nesting habitat due to lack of deep canyons, so the bird is likely to only forage in the Site. Known to occur within 11 miles of site (CNDDB).
golden eagle (*Aquila chrysaetos*)	-- / -- / FP; WL	Broadleaved upland forest; Cismontane woodland; Coastal prairie; Great Basin grassland; Great Basin scrub; Lower montane coniferous forest; Pinon & juniper woodlands; Upper montane coniferous forest; Valley & foothill grassland. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas. Rolling foothills, mountain areas, sage-juniper flats, and desert.	**Moderate:** The Site and surrounding area is considered low predicted habitat but is adjacent to medium predicted habitat (CDFW 2024b). Recent sightings have occurred in the vicinity of the Site (iNaturalist 2018, 2021) that suggest this species may use the Site and surrounding area as foraging grounds. Unlikely to nest due to lack of preferred nesting habitat, but occasionally uses transmission towers.

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
ferruginous hawk (*Buteo regalis*)	-- / -- / WL	Great Basin grassland; Great Basin scrub; Pinon & juniper woodlands; Valley & foothill grassland. Eats mostly lagomorphs, ground squirrels, and mice. Population trends may follow lagomorph population cycles. Open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats.	**High:** Known to overwinter in the vicinity of the Site. Recent sightings have occurred about 10 miles west (iNaturalist 2023), suggesting that this species may forage in and around the Site. The February survey revealed the presence of lagomorphs and rodent species, which are the preferred diet of this species. Unlikely to nest in Site, breeds northeast of CA. However, may forage or roost in the Site during winter.
prairie falcon (*Falco mexicanus*)	-- / -- / WL	Great Basin grassland; Great Basin scrub; Mojavean Desert scrub; Sonoran Desert scrub; Valley & foothill grassland. Breeding sites located on cliffs. Forages far afield, even to marshlands and ocean shores. Inhabits dry, open terrain, either level or hilly.	**Moderate:** (year-round) Known to occur in the Site vicinity. This species is known to have a vast foraging range, which may include the Site and Study Areas. It is unlikely that this species would nest in the Site due to a lack of suitable cliff-side habitat. However, has occasionally been known to nest in transmission towers. No recent sightings have occurred in the vicinity.
mountain plover (*Charadrius montanus*)	-- / -- / SSC	Chenopod scrub; Valley & foothill grassland. Short vegetation, bare ground, and flat topography. prefers grazed areas and areas with burrowing rodents. Short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms.	**Low:** (seasonal) The Site is not considered predicted habitat for this species, but high predicted habitat resides 0.5 miles south of the Site (CDFW 2024b). No recent sightings have occurred in the vicinity of the Site. This species is only known to occur in this vicinity during non-breeding periods (Cornell 2024). May transit or forage on Site.
burrowing owl (*Athene cunicularia*)	-- / -- / SSC	Coastal prairie; Coastal scrub; Great Basin grassland; Great Basin scrub; Mojavean Desert scrub; Sonoran Desert scrub; Valley & foothill grassland. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel. Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation.	**High:** The Site contains many burrows that would serve as suitable dwellings for this species. In addition, riprap drainage along south edge of Study Area may provide habitat for surrogate burrows. Typically occurs in areas with low-growing vegetation (< 1m). May also utilize openings in creosote scrub, along roads, or powerlines. A burrowing owl was observed about 1200 m south of the Study Area.

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
long-eared owl (*Asio otus*)	-- / -- / SSC	Cismontane woodland; Great Basin scrub; Riparian Forest; Riparian woodland; Upper montane coniferous forest. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding. Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses.	**Low:** This species will not nest in the Site, as it prefers densely forested habitat, and this species is non-breeding in this region (Cornell 2024). However, there is medium predicted habitat in the mountain range bordering the Site (CDFW 2024b). Therefore, it may forage on Site for small mammals, which appear to be abundant given the number of burrows observed during the February survey.
Le Conte's thrasher (*Toxostoma lecontei*)	-- / -- / SSC	Desert wash; Mojavean Desert scrub; Sonoran Desert scrub. Commonly nests in a dense, spiny shrub or densely branched cactus in desert wash habitat, usually 2-8 feet above ground. Desert resident; primarily of open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub habitats.	**High:** Known to occur in the Site vicinity and Site is considered high potential habitat (CDFW 2024b). Potential to nest in suitable habitat on Site.
loggerhead shrike (*Lanius ludovicianus*)	-- / -- / SSC	Broadleaved upland forest; Desert wash; Joshua tree woodland; Mojavean Desert scrub; Pinon & juniper woodlands; Riparian woodland; Sonoran Desert scrub. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting. Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub & washes.	**Present:** Observed in the Site during the February survey. Also observed nearby during April 2023 surveys. Potential to nest in suitable habitat on Site.
Mammals			
San Joaquin pocket mouse (*Perognathus inornatus*)	-- / -- / SSC	Cismontane woodland; Mojavean Desert scrub; Valley & foothill grassland. Associated with fine-textured, sandy, friable soils. Grassland, oak savanna and arid scrubland in the southern Sacramento valley, Salinas valley, San Joaquin valley and adjacent foothills, south to the Mojave Desert.	**Low:** Known to occur in the vicinity of the Site. However, typically found in more open, flat grassland or woodland. Site is not within CDFW predicted habitat (CDFW 2024b).

Species	Status* Federal/State/ CRPR	Habitat Requirements	Potential to Occur
Tehachapi pocket mouse (*Perognathus alticola inexpectatus*)	-- / -- / SSC	Chaparral; Joshua tree woodland; Valley & foothill grassland. Burrows for cover and nesting. Aestivates and hibernates during extreme weather. Forages on open ground and under shrubs. Arid annual grassland and desert shrub communities, but also taken in fallow grain fields and in Russian thistle.	**High:** Many burrows observed during the February survey throughout the Site. Plenty of open ground and shrub cover is available on Site for foraging. Known to occur in the vicinity. Most recently sighted in 2011 (CNDDB).
Insects			
monarch - California overwintering population (*Danaus plexippus pop. 1*)*	FC / -- / --	Closed-cone coniferous forest. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby. Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	**Low:** The Site does not contain habitat that supports overwintering for this species and native milkweeds used during breeding were not observed; however, it may nectar in the Site area during migration.

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

FC Federal Candidate for listing under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

-- Tracked by CNDDB, but not federally or state listed

* Scheduled to be federally listed in 2024

5.0 Discussion and Recommendations

To support environmental permitting and conservation, the following measures are recommended:

1. **Focused Surveys by a qualified biologist:**

    a. **Desert Tortoise Presence/Absence Survey (Federally and State Threatened).** Desert tortoise was not directly observed during the field survey. However, a potential burrow was observed about 100 meters north of the Study Area, the Site is within the known range of desert tortoise, potentially suitable desert tortoise habitat is present within the Study Area, and desert tortoise has been observed about 1.5 miles northwest of the site as recently as 2010. A presence/absence survey for desert tortoise following USFWS protocol is recommended to determine if the project will require USFWS permitting.

    b. Swainson's Hawk Habitat Assessment (State Threatened). TRC recommends the project vicinity (one-mile radius) be surveyed for Swainson's Hawk nesting sites that could potentially be impacted by construction disturbances. If nesting sites occur in the vicinity, construction mitigation measures should be developed and CDFW may require a protocol-level Swainson's hawk survey. An active Swainson's hawk nest was documented approximately two miles southeast of the Site in 2020.

    c. Burrowing Owl (State Species of Special Concern). No burrowing owls were observed in the Study Area. However, a burrowing owl was observed flying across 170th St W about 1200 meters south of the project site. Portions of the Site contain moderate potential for nesting and foraging habitat for burrowing owl. TRC recommends a burrowing owl survey following CDFW guidelines (CDFW 2012). If the site is found to be occupied by burrowing owls, a subsequent nesting season survey may be required.

    d. **Joshua tree inventory**. TRC recommends conducting a Joshua tree inventory to support consultation with CDFW for an incidental take permit for Joshua tree. As a Candidate for listing, the tree provisionally receives the same protections as a state-listed endangered or threatened species. The Western Joshua Tree Conservation Act (WJTCA) was enacted in July 2023 and prohibits the importation, export, take, possession, purchase, or sale of any western Joshua tree in California unless authorized by CDFW (CDFW 2024c).

    e. **Rare plant surveys**. TRC recommends at least two rare plant surveys during the appropriate blooming period of special status plants with the highest potential to occur on the Site. One survey in April and one survey in June should capture most special status species with potential to occur on the Site. No special status plant species were observed during the February 02, 2024 field survey. However, the survey was not conducted at the appropriate time of year to observe many flowering species, including those with potential to occur at the Site. Therefore, a rare plant survey conducted in accordance with CDFW protocols for surveying special status plants (CDFW 2018) is recommended.

2. **Ephemeral drainage avoidance**. The ephemeral stream in the western portion of Tie-line Study Area is likely under the jurisdiction of the California Department of Fish and Wildlife and the Lahontan Regional Water Quality Control Board. Any project activities that change the grade or filled the stream may require a Lake and Streambed Agreement or 401 Certification. Therefore, TRC recommends avoiding the ephemeral stream during site design.

3. **Pre-construction nesting birds and raptor surveys**. The transmission poles and shrubs within the Study Area provide suitable nesting habitat for a wide variety of migratory birds, including special status raptors. Raptors and migratory birds are protected by the MBTA and California Fish and Game Code (Section 2). If project activities are scheduled during the breeding season (February 1 through September 1), TRC recommends that standard minimization and avoidance measures be followed. These measures include, but are not limited to, pre-construction surveys and avoidance of active bird nests through the use of a work exclusion buffer zone. Pre-construction surveys for nesting birds are typically scheduled no more than three days before the start of project activities.

4. **Pre-construction surveys for special status wildlife**. TRC recommends pre-construction surveys by a qualified biologist for sensitive wildlife with potential to occur within the Study Area. Pre-construction surveys are typically conducted within seven days of the start of project activities. Wildlife surveys should be conducted at the appropriate times of day to detect both crepuscular and diurnal species.

6.0 References

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Appendix A

Site Photographs



Photo 1. Looking South. North of Access Road in southeast corner of Site.



Photo 2. Looking North. Low growing vegetation in Site.



Photo 3. Looking northwest. Ephemeral Stream. South of Access Road near southwest corner of Tie-line Study Area.



Photo 4. Looking northeast. North of Access Road, west side of Site. Joshua trees in background.



Photo 5. Looking south. Northwest portion of the Site. Joshua trees in foreground.



Photo 6. Looking northwest. Ephemeral stream south of Access Road in Tie-line Study Area. Likely non-jurisdictional.



Photo 7. Looking South. Northwestern-most edge of Study Area.



Photo 8. Joshua Trees on Site.



Photo 9. Inactive potential desert tortoise &/or American badger burrow north of the Study Area.



Photo 10. Kangaroo rat burrow in the Site.



Photo 11. Potential antelope squirrel divots and burrows in the Site.



Photo 12. Loggerhead shrike perched in creosote bush in Study Area, about 80 feet east of the Site.

Appendix B

Plants and Wildlife Observed or Detected by Sign

Observed Plants, Selak Euismod BESS Site, Kern County, CA. February 2, 2024.

Family	Species	Common Name	Cal IPC^ or Special Status Rank
AGAVACEAE - AGAVE FAMILY	*Yucca brevifolia*	Joshua tree	State Candidate
ASTERACEAE - SUNFLOWER FAMILY	*Ericameria nauseosa*	rubber rabbitbrush	
ASTERACEAE - SUNFLOWER FAMILY	*Ericameria cooperi*	Cooper's goldenbush	
ASTERACEAE - SUNFLOWER FAMILY	*Lessingia glandulifera*	valley vinegar weed	
BORAGINACEAE - BORAGE FAMILY	*Amsinckia tesselata*	devil's lettuce	
BRASSICACEAE - MUSTARD FAMILY	*Sisymbrium altissimum**	tumble mustard	
CACTACEAE - CACTUS FAMILY	*Cylindropuntia echinocarpa*	silver cholla	
CHENOPODIACEAE - GOOSEFOOT FAMILY	*Krascheninnikovia lanata*	winter fat	
EPHEDRACEAE - EPHEDRA FAMILY	*Ephedra viridis*	green ephedra	
GERANIACEAE - GERANIUM FAMILY	*Erodium cicutarium**	redstem filaree	Cal IPC-Limited
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissoniopsis pallida*	pale yellow suncup	
POACEAE - GRASS FAMILY	*Bromus tectorum**	cheat grass	Cal IPC-High
POACEAE - GRASS FAMILY	*Stipa hymenoides*	sand rice grass	
POLYGONACEAE - BUCKWHEAT FAMILY	*Eriogonum* sp.	annual buckwheat	
POLYGONACEAE - BUCKWHEAT FAMILY	*Eriogonum angulosum*	anglestem buckwheat	
ZYGOPHYLLACEAE - CALTROP FAMILY	*Larrea tridentata*	creosote bush	

*non-native
^Cal IPC = California Invasive Plant Council

Cal IPC Ratings (from https://cal-ipc.org/plants/inventory)
High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Moderate – These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited – These species are invasive, but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Observed Wildlife, Selak Euismod BESS Site, Kern County, CA. February 2, 2024.

Scientific name	Common name
INSECTA	**INSECTS**
Lepidoptera	**Butterflies and Moths**
Nymphalidae	Brush-footed Butterflies
Vanessa cardui	painted Lady
REPTILIA	**REPTILES**
Testudinidae	**True land tortoises**
Gopherus agassizii	desert tortoise (burrow)
Phrynosomatidae	**Phrynosomatids**
Uta stansburiana	side-blotched lizard
AVES	**BIRDS**
Accipitridae	**Raptors**
Buteo jamaicensis	red-tailed hawk
Laniidae	**Shrikes**
Lanius ludovicianus^	loggerhead shrike
Corvidae	**Jays and crows**
Corvus corax	common raven
Silviidae	**Gnatcatchers**
Polioptila caerula	blue-gray gnatcatcher
Emberizidae	**Towhees and sparrows**
Zonotrichia leucophrys	white-crowned sparrow
MAMMALIA	**MAMMALS**
Canidae	**Dogs/wolves/foxes**
Canis latrans	coyote (scat)
Leporidae	**Hares and rabbits**
Lepus sp.	jackrabbit sp.
Sciuridae	**Squirrels**
Ammospermophilus leucurus	white-tailed antelope ground squirrel
Geomyidae	**Pocket gophers**
Thomomys sp.	pocket gopher sp. (burrows & tracks)
Heteromyidae	**Pocket mice, kangaroo rats**
Dipodomys sp.	kangaroo rat (burrows)
Mustelidae	**Weasels and allies**
Taxidea taxus^	American badger (burrow)

^ CDFW Species of Special Concern
* Non-native species

Appendix C

Database Queries

CNDDB Query Results, 5-mile Radius, Selak Euismod Site, Kern County, CA, January 31, 2024.

SCIENTIFIC NAME	COMMON NAME	PRESENCE	SITE DATE	FED LIST	CAL LIST	CDFW STATUS
Charina umbratica	southern rubber boa	Presumed Extant	20120506	None	Threatened	None
Falco mexicanus	prairie falcon	Presumed Extant	1977XXXX	None	None	WL
Lanius ludovicianus	loggerhead shrike	Presumed Extant	20110121	None	None	SSC
Lanius ludovicianus	loggerhead shrike	Presumed Extant	20110121	None	None	SSC
Toxostoma lecontei	Le Conte's thrasher	Presumed Extant	19680921	None	None	SSC
Perognathus inornatus	San Joaquin pocket mouse	Presumed Extant	20100606	None	None	None
Anniella pulchra	Northern California legless lizard	Presumed Extant	20051123	None	None	SSC
Charadrius montanus	mountain plover	Presumed Extant	20051111	None	None	SSC
Aquila chrysaetos	golden eagle	Presumed Extant	19981110	None	None	FP; WL
Charadrius montanus	mountain plover	Presumed Extant	20110312	None	None	SSC
Buteo regalis	ferruginous hawk	Presumed Extant	20110330	None	None	WL
Falco columbarius	merlin	Presumed Extant	20110127	None	None	WL
Gopherus agassizii	desert tortoise	Presumed Extant	20100528	Threatened	Threatened	
Falco columbarius	merlin	Presumed Extant	20101209	None	None	WL
Buteo regalis	ferruginous hawk	Presumed Extant	20110126	None	None	WL
Buteo regalis	ferruginous hawk	Presumed Extant	20110214	None	None	WL
Buteo regalis	ferruginous hawk	Presumed Extant	20110222	None	None	WL
Buteo regalis	ferruginous hawk	Presumed Extant	20110329	None	None	WL
Buteo regalis	ferruginous hawk	Presumed Extant	20110322	None	None	WL
Anniella pulchra	Northern California legless lizard	Presumed Extant	20190528	None	None	SSC
Buteo swainsoni	Swainson's hawk	Presumed Extant	20200626	None	Threatened	
Asio otus	long-eared owl	Extirpated	20110523	None	None	SSC
Anniella pulchra	Northern California legless lizard	Presumed Extant	20110214	None	None	SSC
Buteo swainsoni	Swainson's hawk	Presumed Extant	20210617	None	Threatened	
Athene cunicularia	burrowing owl	Presumed Extant	20070911	None	None	SSC
Athene cunicularia	burrowing owl	Presumed Extant	20070911	None	None	SSC
Perognathus alticola inexpectatus	Tehachapi pocket mouse	Presumed Extant	20110618	None	None	SSC
Athene cunicularia	burrowing owl	Presumed Extant	20110302	None	None	SSC
Athene cunicularia	burrowing owl	Presumed Extant	20110304	None	None	SSC
Lanius ludovicianus	loggerhead shrike	Presumed Extant	20110301	None	None	SSC

RPI Query Results, 9-quad search, Selak Euismod site, Kern County, January 30, 2024

SCIENTIFIC NAME	COMMON NAME	CRPR	CESA	FESA	BLOOMING PERIOD
Astragalus hornii var. hornii	Horn's milk-vetch	1B.1	None	None	May-Oct
Calochortus clavatus var. gracilis	slender mariposa-lily	1B.2	None	None	Mar-Jun(Nov)
Calochortus striatus	alkali mariposa-lily	1B.2	None	None	Apr-Jun
Chorizanthe parryi var. fernandina	San Fernando Valley spineflower	1B.1	CE	None	Apr-Jul
Cryptantha clokeyi	Clokey's cryptantha	1B.2	None	None	Apr
Eriophyllum lanatum var. hallii	Fort Tejon woolly sunflower	1B.1	None	None	May-Jul
Eschscholzia lemmonii ssp. kernensis	Tejon poppy	1B.1	None	None	(Feb)Mar-May
Leptosiphon serrulatus	Madera leptosiphon	1B.2	None	None	Apr-May
Lupinus peirsonii	Peirson's lupine	1B.3	None	None	Apr-Jun
Monardella linoides ssp. anemonoides	southern Sierra monardella	1B.3	None	None	Jun-Aug
Monardella linoides ssp. oblonga	Tehachapi monardella	1B.3	None	None	(May)Jun-Aug
Muhlenbergia utilis	aparejo grass	2B.2	None	None	Mar-Oct
Navarretia fossalis	spreading navarretia	1B.1	None	FT	Apr-Jun
Nemacladus secundiflorus var. robbinsii	Robbins' nemacladus	1B.2	None	None	Apr-Jun
Opuntia basilaris var. brachyclada	short-joint beavertail	1B.2	None	None	Apr-Jun(Aug)
Opuntia basilaris var. treleasei	Bakersfield cactus	1B.1	CE	FE	Apr-May
Sidalcea neomexicana	salt spring checkerbloom	2B.2	None	None	Mar-Jun
Streptanthus campestris	southern jewelflower	1B.3	None	None	(Apr)May-Jul
Symphyotrichum greatae	Greata's aster	1B.3	None	None	Jun-Oct

Appendix B

Observed Species Compendium

Wildlife Species Observed Compendium

Scientific name	Common name
AVES	**BIRDS**
Accipitridae	**Raptors**
Buteo jamaicensis	red-tailed hawk
Caprimulgidae	**Nightjars**
Chordeiles acutipennis	lesser nighthawk
Columbidae	**Pigeons and doves**
Zenaida macroura	mourning dove
Corvidae	**Jays and crows**
Corvus corax	common raven
Fringillidae	**Finches**
Haemorhous mexicanus	house finch
Laniidae	**Shrikes**
Lanius ludovicianus^	loggerhead shrike^
Mimidae	**Mockingbirds and thrashers**
Mimus polyglottos	northern mockingbird
Passerellidae	**New World Sparrows**
Spizella breweri	Brewer's sparrow
Zonotrichia leucophrys	white-crowned sparrow
Sturnidae	**Starlings**
*Sturnus vulgaris**	European starling
Silviidae	**Gnatcatchers**
Polioptila caerula	blue-gray gnatcatcher
Troglodytidae	**Wrens**
Campylorhynchus brunneicapillus	cactus wren
Troglodytes aedon	house wren
Tyrannidae	**Tyrant flycatchers**
Myarchus cinerascens	ash-throated flycatcher
INSECTA	**INSECTS**
Tenebrionidae	**Darkling beetles**
Coelocnemis dilaticollis	California broad-necked darkling beetle
Meloidae	**Blister Beetles**
Cysteodemus armatus	inflated blister beetle
Lytta magister	master blister beetle
Nymphalidae	**Brush-footed butterflies**
Vanessa cardui	painted Lady
Apidae	**Bees**
Apis mellifera	honey bee
Mutillidae	**Velvet Ants**
Dasymutilla albiceris	velvet ant
Formicidae	**Ants**
Pogonomyrmex californicus	California harvester ant
Vespidae	**Eusocial wasps**
Vespula sp.	yellowjacket wasp

MAMMALIA	MAMMALS
Bovidae	**Bovids**
Ovis aries	domestic sheep
Canidae	**Dogs/Wolves/Foxes**
Canis latrans	Coyote (scat, tracks, voice)
Heteromyidae	**Pocket mice, kangaroo rats**
Dipodomys merriami	Merriam's kangaroo rat (dead)
Dipodomys sp.	Kangaroo rat
Leporidae	**Hares and rabbits**
Lepus californicus	black-tailed jackrabbit
Sciuridae	**Squirrels**
Ammospermophilus leucurus	white-tailed antelope ground squirrel
REPTILIA	**REPTILES**
Crotophytidae	**Crotophytids**
Gambelia wislizenii	long-nosed leopard lizard
Phrynosomatidae	**Phrynosomatids**
Uta stansburiana	side-blotched lizard
Teiidae	**Whiptail lizards**
Aspidoscelis tigris	Western whiptail
Viperidae	**Vipers**
Crotalus scutulatus	Mojave rattlesnake
^ CDFW Species of Special Concern *** Non-native species**	

Plant Species Observed Compendium

Species	Common Name	Cal IPC^ or Special Status Rank
Agavaceae - Agave Family		
Yucca brevifolia	Joshua tree	State Candidate
Amarathaceae – Amaranth Family		
Grayia spinosa	spiny hop sage	
Krascheninnikovia lanata	winterfat	
Asteraceae - Sunflower Family		
Acamptopappus sphaerocephalus	rayless goldenhead	
Ambrosia acanthicarpa	annual bur-sage	
Ambrosia dumosa	white bur-sage	
Ambrosia salsola	cheesebush	
Encelia actoni	Acton's brittlebush	
Ericameria cooperi	Cooper's goldenbush	
Ericameria nauseosa	rubber rabbitbrush	
Gutierrezia microcephala	sticky snakeweed	
*Lactuca serriola**	prickly lettuce	
Lasthenia sp.	goldfields, probably *gracilis*	
Lasthenia californica	California goldfields	
Leptosyne calliopsidea	leaf-stem tickseed	
Lessingia glandulifera	valley vinegar weed	
Logfia depressa	dwarf cottonrose	
Malacothrix glabrata	smooth desert dandelion	
Stephanomeria exigua	small wire-lettuce	
Stephanomeria pauciflora	wire-lettuce	
Uropappus lindleyi	silver puffs	
Brassicaceae – Mustard Family		
Sisymbrium spp.	rocket mustard	
*Sisymbrium altissimum**	tumble mustard	
Boraginaceae - Borage Family		
Amsinckia sp.	fiddleneck	
Amsinckia tessellata	tessellated fiddleneck	
Cryptantha decipiens	gravel cryptantha	
Cryptantha micrantha var. *micrantha*	red-root cryptantha	
Cryptantha muricata var. *muricata*	showy prickly cryptantha	
Cryptantha sp.	popcorn flowers	
Greeneocharis circumscissa var. *circumscissa*	cushion greeneocharis	
Pectocarya heterocarpa	mixed-nut pectocarya	
Pectocarya linearis ssp. *ferocula*	narrow-toothed pectocarya	
Phacelia fremontii	Fremont's phacelia	
Phacelia tanacetifolia	lacy phacelia	
Plagiobothrys arizonicus	Arizona popcornflower	
Cactaceae - Cactus Family		
Cylindropuntia echinocarpa	silver cholla	
Chenopodiaceae - Goosefoot Family		
Grayia spinosa	spiny hopsage	
*Salsola tragus**	Russian-thistle	

Species	Common Name	Cal IPC^ or Special Status Rank
Curcurbitaceae – Gourd Family		
Marah macrocarpa	large fruit wild cucumber	
Ephedraceae - Ephedra Family		
Ephedra sp.	Ephedra	
Ephedra californica	California ephedra	
Ephedra viridis	green ephedra	
Euphorbiaceae – Spurge Family		
Croton setiger	dove weed	
Euphorbia albomarginata	rattlesnake weed	
Faboideae – Fabaceae Family		
Astragalus didymocarpus	two-seeded milk vetch	
Astragalus layneae	Layne milk vetch	
Astragalus lentiginosus	freckled milk vetch	
Lupinus microcarpus var. *densiflorus*	chick lupine	
Geraniaceae - Geranium Family		
*Erodium cicutarium**	redstem filaree	Cal IPC- Limited
Lamiaceae - Mint Family		
Salvia carduacea	thistle sage	
Salvia columbariae	chia	
Malvaceae - Mallow Family		
Eremalche exilis	white fivespot	
Montiaceae - Miner's-Lettuce Family		
Calyptridium monandrum	common pussypaws	
Nyctaginaceae - Four O'clock Family		
Mirabilis laevis	wishbone plant	
Onagraceae - Evening Primrose Family		
Camissonia sp.	suncup	
Camissonia campestris	Mojave suncup	
Camissonia kernesis ssp. gilmanii	Gilman’s evening-primrose	
Camissoniopsis hirtella	hairy suncup	
Camissoniopsis sp.	evening primrose	
Camissoniopsis pallida	pale yellow suncup	
Eremothera boothii	Booth’s evening primrose	
Eulobus californicus	false mustard/California primrose	
Orobanchaceae - Broom-Rape Family		
Castilleja exserta	purple owl's clover	
Papaveraceae – Poppy Family		
Eschscholzia californica	California poppy	
Poaceae - Grass Family		
*Bromus diandrus**	ripgut grass	
Bromus madritensis ssp. *rubens**	red brome	Cal IPC-High
*Bromus tectorum**	cheat grass	Cal IPC-High
*Festuca bromoides**	brome fescue	
*Hordeum murinum**	wall barley	Cal IPC-Moderate
Poa secunda	one-sided blue grass	
Schismus spp.	Mediterranean grass	
Stipa hymenoides	Indian rice grass	
Stipa lepida	foothill needle grass	
Stipa speciosa	desert needle grass	

Species	Common Name	Cal IPC^ or Special Status Rank
Polemoniaceae - Phlox Family		
Linanthus parryae	sand blossom	
Leptosiphon liniflorus	flax-flowered linanthus	
Loeseliastrum matthewsii	desert calico	
Loeseliastrum schottii	Schott's calico	
Eriastrum sp.	woollystar	
Gilia sp.	gilia	
Polygonaceae - Buckwheat Family		
Chorizanthe brevicomu	brittle spineflower	
Eriogonum angulasum	angle-stem buckwheat	
Eriogonum brachyanthum	short-flower wild buckwheat	
Eriogonum fasciculatum var. *polifoliu*	California buckwheat	
Eriogonum fasciculatum var. *polifolium*	hairy California buckwheat	
Eriogonum gracillimum	rose and white buckwheat	
Eriogonum plumatella	yucca wild buckwheat	
Eriogonum viridescens	two-toothed wild buckwheat	
Solanaceae - Nightshade Family		
Lycium andersonii	Anderson's box-thorn	
Lycium cooperi	Cooper's box-thorn	
Themidaceae - Brodiaea Family		
Dichelostemma capitatum	blue dicks	
Zygophyllaceae – Caltrop Family		
Larrea tridentata	creosote	

***non-native ^Cal IPC = California Invasive Plant Council**	Cal IPC Ratings (from https://cal-ipc.org/plants/inventory) **High** – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically. **Moderate** – These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread. **Limited** – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Appendix C

Potential to Occur Compendium

Potential Special Status Plants

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Alkali mariposa-lily *Calochortus striatus*	-- / -- / 1B.2	Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps. Alkaline meadows and ephemeral washes. Prefers alkaline and mesic substrates. Elevation: 70-1600m. Bloom Period: Apr-Jun	Unlikely to occur. Known to occur in the Rosamond vicinity in alkaline habitats which are not found in the Project area. Not observed during the 2023 – 2025 biological surveys.
Aparejo grass *Muhlenbergia utilis*	-- / -- / 2B.2	Meadows and seeps, marshes and swamps, chaparral, coastal scrub, cismontane woodland. Sometimes alkaline, sometimes serpentinite. Elevation: 25-2325 m. Bloom Period: Mar-Oct	Unlikely to occur. Occurs in a different geographic range and habitat than the Project Area. Known from the South Coast Ranges and Western Transverse Range in habitat types not found in the Mojave desert. Not observed during the 2023-2025 biological surveys.
Bakersfield cactus *Opuntia basilaris* var. *treleasei*	E / E / 1B.1	Chenopod scrub, valley and foothill grassland, cismontane woodland. Coarse or cobbly well- drained granitic sand on bluffs, low hills, and flats, within grassland. Elevation: 85-550 m. Bloom Period: Apr-May	Presumed absent. Preferred grassland or chenopod scrub habitats are not present on the site and the site is outside the known range and typical elevation range. No *Opuntia basilaris* was observed during the 2023 – 2025 biological surveys.
Clokey's cryptantha *Cryptantha clokeyi*	-- / -- / 1B.2	Mojavean desert scrub. Sandy or gravelly soils. Elevation: 750-1890 m. Bloom Period: Apr-Jun	Not Likely to occur based on no observations during the 2023 – 2025 biological surveys.
Desert cymopterus *Cymopterus clokeyi*	-- / -- / 1B.2	Sandy soils. Joshua tree woodland, Mojavean desert scrub. Elevation: 630-1500 m Bloom Period: Mar - May	Not likely to occur. Loose sandy soils occur north of SR-58, and one occurrence from 1932 collection east of Rosamond on Edwards Air Force Base was recorded. Sandy soils not found in within the Project footprint. This species was not observed during the 2023 – 2025 biological surveys

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Fort Tejon woolly sunflower *Eriophyllum lanatum* var. *hallii*	-- / -- / 1B.1	Chaparral, cismontane woodland. Often on slopes in loamy soils. Elevation: 1065-1435 m. Bloom Period: May-Jul	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. This species was not observed during the 2023 – 2025 biological surveys.
golden goodmania *Goodmania luteola*	-- / -- / 4.2	Alkaline or clay soils. Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland. Numerous occurrences in the Rosamond area. Elevation: 20-2200 m. Bloom Period: Apr – Aug	Unlikely to occur. This species is found in clay or alkaline soils which are not present in the Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Greata's aster *Symphyotrichum greatae*	-- / -- / 1B.3	Chaparral, cismontane woodland, broadleafed upland forest, lower montane coniferous forest, riparian woodland. Mesic canyons. Elevation: 335-2015 m. Bloom Period: Jun-Oct	Unlikely to occur. Suitable habitat is not present on site. This species was not observed during the 2023 – 2025 biological surveys.
Horn's milk-vetch *Astragalus hornii* var. *hornii*	-- / -- / 1B.1	Meadows and seeps, playas. Lake margins, alkaline sites. Elevation: 75-350 m. Bloom Period: May-Oct	Unlikely to occur. Suitable habitat is not present on site and site is outside typical elevation range. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
inland gilia *Gilia interior*	-- / -- / 4.3	Cismontane woodland; Joshua tree woodland; lower montane coniferous forest; rocky sites. Elevation: 700-1700 m Blooming period: Mar-May	Low potential to occur. This species prefers higher elevations and there are no known sightings beyond the Tehachapi mountains. This species was not observed during the 2023 – 2025 biological surveys.
Joshua tree *Yucca brevifolia*	-- / SC / --	Desert flats, slopes; Pollinated by the yucca moth *Tegeticula synthetica*. Elevation: 400--2300 m Blooming period: Mar-May	**Present.** Occurs throughout the Project footprint and surrounding Study Areas.
Kern County evening-primrose *Camissonia kernensis* ssp. *kernensis*	-- / -- / 4.3	Sandy or gravelly, granitic soils. Chaparral, Joshua tree woodland, pinyon and juniper woodland. Known to occur in the vicinity of the Rosamond, closer to the town of Mojave. Elevation: 790-2130 m Blooming period: Mar-May	Low potential to occur. In sandy or gravelly soils. Known to occur in the vicinity of the Rosamond. This species was not observed during the 2023 – 2025 biological surveys.
Lancaster milk-vetch *Astragalus preussii* var. *laxiflorus*	-- / -- / 1B.1	Alkaline flat. Chenopod scrub. Known to occur only in areas near Lancaster and Edwards AFB. Elevation: ± 700 m Blooming period: Mar - May	Unlikely to occur. This species is known to occur in sites east and south of Rosamond. Suitable habitat - alkaline flats in chenopod scrub – is not found in the Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Madera leptosiphon *Leptosiphon serrulatus*	-- / -- / 1B.2	Cismontane woodland, lower montane coniferous forest. Dry slopes; often on decomposed granite in woodland. Elevation: 80-1645 m. Bloom Period: Apr-May	Unlikely to occur. Suitable habitat is not present on site. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Mojave paintbrush *Castilleja plagiotoma*	-- / -- / 4.3	Great Basin scrub (alluvial), Joshua tree woodland, lower montane coniferous forest, pinyon and juniper woodland. Known to occur in the vicinity of Rosamond and Lancaster. Elevation: 300-2500 m Blooming period: Apr-Jun	Low potential to occur. Potential habitat is present in the Study Area, and this species is known to occur in the vicinity of the Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Mojave spineflower *Chorizanthe spinosa*	-- / -- / 4.2	Alkali playa; chenopod scrub; Joshua tree woodland; Mojavean Desert scrub; sometimes on alkaline soils. Elevation: 600-1300 m Blooming period: Mar-Jul	None. The nearest known occurrences are 10 or more miles from the Study Area. Neither alkaline clay pan nor gravelly sand hard pan habitat occur in the Project area. Skeletons of this species remain identifiable for several years after senescence and no sign of the species has been observed.
crowned muilla *Muilla coronata*	-- / -- / 4.2	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known to occur in the vicinity of Rosamond and Lancaster. Elevation: 670-1960 m Blooming period: Mar-Apr	Low potential to occur. Potential habitat occurs within the Study Area and this species is known to occur in the Project's vicinity. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
pale-yellow layia *Layia heterotricha*	-- / -- / 1B.1	Alkaline or clay. Cismontane woodland, coastal scrub, pinyon and juniper woodland, valley and foothill grassland. Occurrences northwest of Mojave. Elevation: 300-1705 m Blooming Period: Mar - June	Unlikely to occur. This species is known to occur on clay or alkaline soils west of SR-14 and north of Mojave, in the southern Sierra Nevada foothills, Tehachapi Mountain area, San Joaquin Valley, Inner and Outer South Coast Ranges, and Western Transverse Ranges. Therefore, the Project is outside of this species' geographic range and does not contain suitable habitat. This species was not observed during the 2023 – 2025 biological surveys.
Peirson's lupine *Lupinus peirsonii*	-- / -- / 1B.3	Joshua tree woodland, pinyon and juniper woodland, lower montane coniferous forest, upper montane coniferous forest. Decomposed granite slide and talus, on slopes and ridges. Elevation: 1400-2380 m. Bloom Period: Apr-Jun	Unlikely to occur. Suitable habitat is not present in the Study Area and is outside typical elevation range. This species was not observed during the 2023 – 2025 biological surveys.
Peirson's morning-glory *Calystegia peirsonii*	-- / -- / 4.2	Chaparral; chenopod scrub; cismontane woodland; coastal scrub; lower montane coniferous forest; valley & foothill grassland; often in disturbed areas or along roadsides or in grassy, open areas. Elevation: 30-1500 m Blooming period: Apr-Jun	Unlikely to occur. Suitable habitat is not present on Project site lacks adequate precipitation and vegetation communities. No known occurrences are recorded in the Study Area. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Recurved larkspur *Delphinium recurvatum*	-- / -- / 1B.2	Alkaline. Chenopod scrub, cismontane woodland, valley and foothill grassland. Known to occur in the vicinity of Rosamond. Elevation: 3-790 m Bloom Period: Mar - June	Unlikely to occur. This species is known to occur in chenopod scrub (saltbush and winter fat scrub) with alkaline soils. This species is known to occur in the vicinity of Rosamond, however, alkaline, chenopod scrub habitat not found in Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Robbins' nemacladus *Nemacladus secundiflorus* var. *robbinsii*	-- / -- / 1B.2	Chaparral, valley and foothill grassland. Dry, sandy or gravelly slopes. Openings. Elevation: 360-1710 m. Bloom Period: Apr-Jun	Low potential to occur. Suitable substrates are present on site; however, site lacks suitable vegetation communities. This species was not observed during the 2023 – 2025 biological surveys.
Rosamond eriastrum *Eriastrum rosamondense*	-- / -- / 1B.1	Alkaline hummocks, often sandy. Chenopod scrub (openings), vernal pools (edges). Known only from Rosamond and Rogers Dry Lake areas. Elevation: 700-715 m Blooming Period: Apr - May	Unlikely to occur. This species is known to occur in areas surrounding alkali clay pans. There are recorded observations in the Rosamond area. However, suitable habitat is not found in Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Salt spring checkerbloom *Sidalcea neomexicana*	-- / -- / 2B.2	Playas, chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub. Alkali springs and marshes. Elevation: 3-2380 m. Bloom Period: Mar-Jun	None. This species prefers mesic habitats.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
San Fernando Valley spineflower *Chorizanthe parryi* var. *fernandina*	-- / SE / 1B.1	Coastal scrub, valley and foothill grassland. Sandy soils. Elevation: 15-1015 m. Bloom Period: Apr-Jul	Unlikely to occur. This species is not known to occur north of Los Angeles County. Suitable sandy coastal scrub habitat is not present in the Study Area. This species was not observed during the 2023 – 2025 biological surveys.
Short-joint beavertail *Opuntia basilaris* var. *brachyclada*	-- / -- / 1B.2	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Sandy soil or coarse, granitic loam. Elevation: 425-2015 m. Bloom Period: Apr-June; Aug	Unlikely to occur. This species is known to occur to the south and west of Lancaster, in the San Gabriel Mountains and San Bernardino Mountains, outside the geographic range of this Project area. This species was not observed during the 2023 – 2025 biological surveys.
Slender mariposa-lily *Calochortus clavatus* var. *gracilis*	-- / -- / 1B.2	Chaparral, coastal scrub, valley and foothill grassland. Shaded foothill canyons; often on grassy slopes within other habitat. Elevation: 210-1815 m. Bloom Period: Mar-Jun; Nov	Unlikely to occur. Shaded foothills and grassy slopes are not present within the Project footprint. This species was not observed during the 2023 – 2025 biological surveys.
Southern jewelflower *Streptanthus campestris*	-- / -- / 1B.3	Chaparral, lower montane coniferous forest, pinyon and juniper woodland. Open, rocky areas. Elevation: 605-2590 m. Blooming Period: Apr-Jul	Unlikely to occur. Suitable habitat is not present in the Study Area. This species is known to occur to the south and west of Lancaster, in the San Gabriel, San Bernardino, and San Jacinto Mountains, outside the geographic range of this Project. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Spreading navarretia *Navarretia fossalis*	FT / -- / 1B.1	Vernal pools, chenopod scrub, marshes and swamps, playas. San Diego hardpan and San Diego claypan vernal pools; in swales & vernal pools, often surrounded by other habitat types. Elevation: 15-850 m. Blooming Period: Apr-Jun	Unlikely to occur. Suitable habitat is not present in the Study Area. This species was not observed during the 2023 – 2025 biological surveys.
San Joaquin bluecurls *Trichostema ovatum*	-- / -- / 4.2	Grassland, disturbed sites. Elevation: <300 m. Blooming Period: Jul-Oct	**Moderate** potential to occur. One 2017 occurrence of this species is recorded west of Rosamond, along the roadside. This species' known range is from the southern San Joaquin Valley and the Western Transverse Range. This species was not observed during the 2023 – 2025 biological surveys.
Southern Sierra monardella (*Monardella linoides* ssp. *anemonoides*)	-- / -- / 1B.3	Chaparral; Cismontane woodland; Lower montane coniferous forest - occurs usually in non-wetlands, occasionally in wetlands (low water tolerant). Elevation: 750-2000 m Blooming period: Jun-Aug	None. Suitable chaparral, cismontane woodland, and lower montane coniferous forest habitat do not occur in the site. The site's average temperatures, mean precipitation, and soil pH are not within this species' typical range.
Tehachapi monardella *Monardella linoides* ssp. *oblonga*	-- / -- / 1B.3	Lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland. On dry slopes of yellow pine forest, decomposed granitic soils; also in roadside disturbed areas. Elevation: 1430-2655 m. Blooming Period: May-Aug	Unlikely to occur. Suitable habitat is not present in the Study Area and is outside typical elevation range. This species was not observed during the 2023 – 2025 biological surveys.

Species	Status* Federal/ State/ CRPR	Habitat Requirements	Potential to Occur[1]
Tejon poppy *Eschscholzia lemmonii* ssp. *kernensis*	-- / -- / 1B.1	Valley and foothill grassland, chenopod scrub. Little information available on habitat. Elevation: 135-1355 m. Blooming Period: Feb-May	None. Known to occur in the western Tehachapi Mountain area in open grassland often in calcareous soil. Project is outside the geographic range and habitat for this species.
White pygmy-poppy *Canbya candida*	-- / -- / 4.2	Gravelly, sandy, granitic soils. Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Numerous occurrences in the Rosamond area. Elevation: 600-1460 m. Blooming Period: Mar - June	Low potential to occur. The study area contains potential, though not ideal, habitat. Soils in Project Area consist of loamy sand or sandy loam. The species is known to occur from the Rosamond area. This species was not observed during the 2023 – 2025 biological surveys.

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

California Rare Plant Rank (CRPR)

1A Plant assumed extinct in California

1B Plants rare, threatened, or endangered in California and elsewhere

2 Plants rare, threatened, or endangered in California, but more common elsewhere

Threat Ranks

0.1-Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2-Fairly threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3-Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

(1) Potential to occur is based on consideration of the collective survey data.

Potential Special Status Wildlife

Species	Status* Federal/State	Habitat Requirements	Potential to Occur
Reptiles			
Desert tortoise *Gopherus agassizii*	FT / ST	Most common in desert scrub, desert wash, and Joshua tree habitats; occurs in almost every desert habitat. Require friable soil for burrow and nest construction. Creosote bush habitat with large annual wildflower blooms preferred.	**Presumed Absent** based on no observation of individuals or recent sign during presence/absence surveys in 2024 and 2025.
Southern rubber boa *Charina umbratica*	-- / ST	Meadow & seep; Riparian forest; Riparian woodland; Upper montane coniferous forest; Wetland. Found in vicinity of streams or wet meadows; requires loose, moist soil for burrowing; seeks cover in rotting logs, rock outcrops, and under surface litter. Known range is from the San Bernardino and San Jacinto mtns, nut can be found in a variety of montane forest habitats. Snakes resembling *C. umbratica* are reported from Mt. Pinos and Tehachapi mtns group with *C. bottae* based on mtdna. Further research needed.	Low potential to occur. The Project Site does not contain suitable habitat due to a general lack of moisture. This species is known to occur about 7 miles northwest of site (CDFW 2025).
Northern California legless lizard *Anniella pulchra*	-- / SSC	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. They prefer soils with a high moisture content.	**High** potential to occur. Sandy soil, sparse vegetation, and ephemeral washes occur on the Project Site. The nearest CNDDB occurrence is adjacent to the proposed tie-line, within the Project Site (CDFW 2025).

Species	Status* Federal/State	Habitat Requirements	Potential to Occur
Birds			
Burrowing owl *Athene cunicularia*	-- / SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low- growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Moderate** potential to occur. Typically occupies areas with lower vegetation (< 1m) but suitable burrows were observed on and near the site including two burrows with old whitewash. This species has been observed about 0.3 miles from the Project Site (eBird 2025).
California condor *Gymnogyps californianus*	FE / SE, FP	Require vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Deep canyons containing clefts in the rocky walls provide nesting sites. Forages up to 100 miles from roost/nest.	**Moderate** potential to occur (forage/transit). May forage through the Project Site but unlikely to nest in the Study Area due to lack of deep canyons. It is known to occur within 10 miles of site.
Costa's hummingbird *Calypte costae*	-- / --	Desert riparian, desert and arid scrub foothill habitats.	**High** potential to occur. The species is known to occur in the Study Area (eBird 2025). Suitable nesting habitat is present in the desert scrub.
Ferruginous hawk *Buteo regalis*	-- / --	Open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats. Eats mostly lagomorphs, ground squirrels, and mice. Population trends may follow lagomorph population cycles.	**High** potential to occur (seasonal). Known to overwinter near the Project Site. Unlikely to nest within the Study Area. This species typically breeds in northeast California. However, may forage in or roost in the Study Area during the winter.
Golden eagle *Aquila chrysaetos*	-- / FP	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	**Moderate** potential to occur. It is known to occur in the Study Area in the winter (eBird 2025, CDFW 2025). This species is unlikely to nest due to lack of preferred nesting habitat but is known to occasionally use transmission towers. This species may forage in or transit the Project Site.

Species	Status* Federal/State	Habitat Requirements	Potential to Occur
Le Conte's thrasher *Toxostoma lecontei*	-- / SSC	Desert resident; primarily of open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub habitats. Commonly nests in a dense, spiny shrub or densely branched cactus in desert wash habitat, usually 2-8 feet above ground.	**High** potential to occur. Known to occur in the Study Area. Potential to nest in suitable habitat within the Project Site.
Loggerhead shrike *Lanius ludovicianus*	-- / SSC	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub & washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	**Present**. Observed in the Study Area during the 2023 – 2025 biological surveys. Cache of prey also observed just outside Study Area. Potential to nest in suitable habitat on the Project Site.
Long-eared owl *Asio otus*	-- / SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	Low potential to occur. It is known to occur in the Study Area uncommonly. May forage within the Study Area. Unlikely to nest on the Project Site due to lack of suitable nesting habitat.
Merlin *Falco columbarius*	-- / --	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands & deserts, farms & ranches. Clumps of trees or windbreaks are required for roosting in open country.	**Moderate** potential to occur (seasonal). Known to occur in the site vicinity in winter. May transit or forage on site. Unlikely to nest on site – breeds further north.
Mountain plover *Charadrius montanus*	-- / SSC	Short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms. Short vegetation, bare ground, and flat topography. Prefers grazed areas and areas with burrowing rodents.	Low potential to occur (seasonal). It is known to occur in the Study Area in the winter. However, the species prefers agricultural fields or grassland when it is wintering. May transit or forage on the Project Site.

Species	Status* Federal/State	Habitat Requirements	Potential to Occur
Prairie falcon *Falco mexicanus*	-- / --	Inhabits dry, open terrain, either level or hilly. Breeding sites located on cliffs. Forages far afield, even to marshlands and ocean shores.	**High** potential to occur. It is known to occur in the Study Area. May transit or forage on the Project Site. Unlikely to nest on site due to lack of suitable cliff-side nesting habitat; however occasionally known to nest in transmission towers.
Swainson's hawk *Buteo swainsoni*	-- / ST	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**High** potential to occur. Adults observed within two miles of the Project Site. Active nest observed in 2025 approximately 5.5 miles southwest of the Project Site. May transit or forage on the Project Site. Preferred foraging habitat is grassland or agricultural. This species has potential to nest in adjacent transmission towers.
Tricolored blackbird *Agelaius tricolor*	-- / ST, SSC	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	Low potential to occur. The species is known to occur in the Study Area (eBird 2025). May transit or forage on site; however, typically forages in agricultural fields or wetlands. Unlikely to nest on the Project Site due to lack of suitable nesting habitat.
Mammals			
Tehachapi pocket mouse *Perognathus alticola inexpectatus*	-- / SSC	Chaparral; Joshua tree woodland; Valley & foothill grassland. Burrows for cover and nesting. Aestivates and hibernates during extreme weather. Forages on open ground and under shrubs. Arid annual grassland and desert shrub communities but also taken in fallow grain fields and in Russian thistle.	**High** potential to occur. Many burrows were observed during the February survey throughout the Project Site. Plenty of open ground and shrub cover is available on the Project Site for foraging. This species is known to occur in the Study Area, with the most recent sighting in 2011 (CDFW 2025).
San Joaquin pocket mouse *Perognathus inornatus*	-- / SSC	Grassland, oak savanna and arid scrubland in the southern Sacramento Valley, Salinas Valley, San Joaquin Valley and adjacent foothills, south to the Mojave Desert. Associated with fine-textured, sandy, friable soils.	Low potential to occur. Known to occur in the Study Area. However, it is typically found in more open, flat grassland or woodland. Project Site is not within CDFW predicted habitat (CDFW 2021; CWHR M087).

Species	Status* Federal/State	Habitat Requirements	Potential to Occur
Tulare grasshopper mouse *Onychomys torridus tularensis*	-- / SSC	Hot, arid valleys and scrub deserts in the southern San Joaquin Valley. Diet is almost exclusively composed of arthropods, therefore needs abundant supply of insects.	**High** potential to occur. The species is known to occur in the vicinity of the Project Site. Grasshopper mice are often associated with kangaroo rats, and kangaroo rat burrows were observed on the Project Site. The Study Area is mapped as highly suitable from CDFW's predicted habitat model for this species (CDFW 2021; CWHR M122).
Insects			
Monarch - California overwintering population *Danaus plexippus pop. 1**	FC / --	Closed-cone coniferous forest. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby. Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	Low potential to occur. The Project Site does not contain habitat that supports overwintering for this species and native milkweeds used during breeding were not observed; however, it may forage on nectar in the Study Area during migration.

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

-- Tracked by CNDDB, but not federally or state listed

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Appendix C2
Rare Plant Survey Reports

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Rare Plants Survey Report

Euismod Site
Kern County, CA

August 2024 Rev 0.1

Prepared For:

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Executive Summary

Between April 30 and May 30, 2024, TRC Environmental Solutions, Inc. biologists performed two rare plant surveys on nine parcels planned for development in conjunction with the Euismod Project, plus a surrounding 50-foot buffer area. In total, the surveys encompassed approximately 96.2 acres (Study Area). The work included a preparatory desktop review to identify rare plants with potential to occur in the area, field survey, and preparation of this report. The timing of the field surveys coincided with the blooming periods of the targeted rare plant species, especially those with a higher chance of occurring in the Study Area. The field survey was conducted by walking meandering transects throughout the Study Area, visually scanning the landscape for novel plant species and paying particularly close attention to areas that included dry drainage beds. Joshua tree (Yucca brevifolia), a Candidate for listing under the California Endangered Species Act, was observed throughout the Study Area.

This report describes the project setting and regulatory background for context, describes study methods, provides a table of species considered to have potential to occur in the project area, describes and discusses the results of the desktop study and field surveys, and provides recommendations. No special status species other than Joshua tree were observed in the Study Area. Mojave spineflower (*Chorizanthe spinosa*) and Clokey's cryptantha (*Cryptantha clokeyi*) were judged to have a Moderate potential to occur but were not observed during the surveys. Recommendations made are: (1) complete a western Joshua tree census following CDFW requirements; and (2) conduct a pre-construction survey for Mojave spineflower (*Chorizanthe spinosa*) and Clokey's cryptantha (*Cryptantha clokeyi*).

1.0 Introduction

Euismod Project I LLC is proposing to develop a battery-energy storage system (BESS) project in eastern Kern County, California (Figure 1). The following land parcels (Parcels) are being evaluated for natural resources in conjunction with project planning:

- 261-103-21
- 261-103-20
- 261-103-17
- 261-103-29
- 261-104-19
- 261-104-20
- 261-104-21
- 261-104-16
- 261-104-13

These Parcels are located in Section 14 of Township 9 North, Range 15 West, San Bernardino Principal Meridian (Figure 2). At the time of the field work described in this report, the Parcels consisted of primarily undeveloped desert terrain and unpaved roads.

The BESS will utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available such as from intermittent renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures. The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Whirlwind 220 kV substation located approximately 350 meters to the south.

This rare plant survey report documents the methodologies and results of a desktop review and field survey encompassing nine of the Parcels and a 50-foot (ft) buffer (96.2-acres), referred to herein as the Study Area. The purpose of the rare plant survey was to evaluate the potential for presence of special status species or protected habitats within the Study Area and provide guidance on whether permits, avoidance, minimization, or mitigation related to special status plants or plant communities would be required for the proposed project.

1.1 Purpose and Scope

The rare plant survey was conducted to observe for the possible presence of sensitive plant species of California and potential need for avoidance, minimization, or mitigation measures that would be required for the proposed BESS development within the Study Area. Goals of the work included:

- Determine special status plant species or sensitive natural communities that are known to occur within the Study Area or its vicinity.

- Ascertain the presence, or likely presence, of California Native Plant Society-ranked, state-listed, or federal-listed species or their habitat.

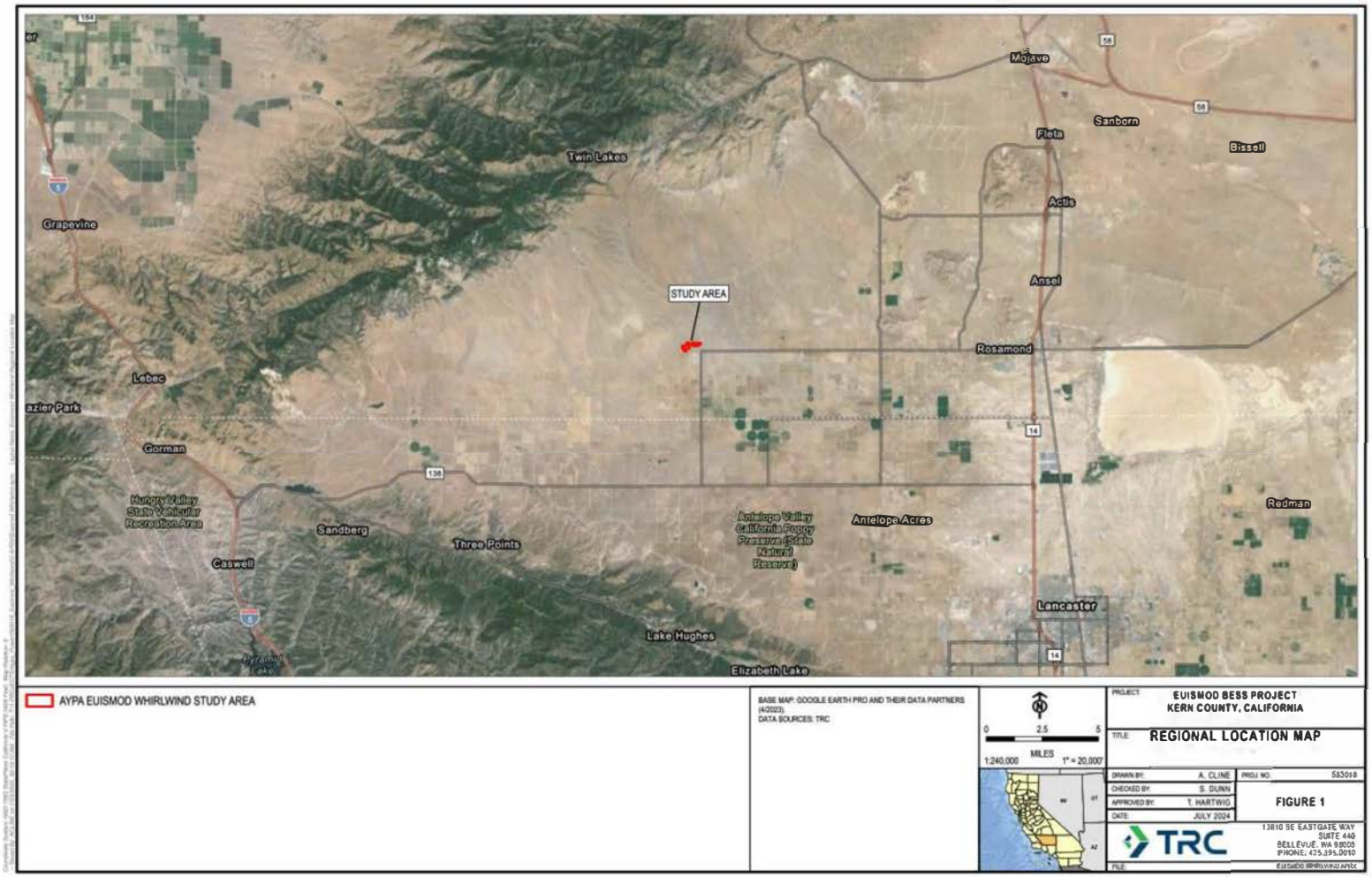


Figure 1: Project Location

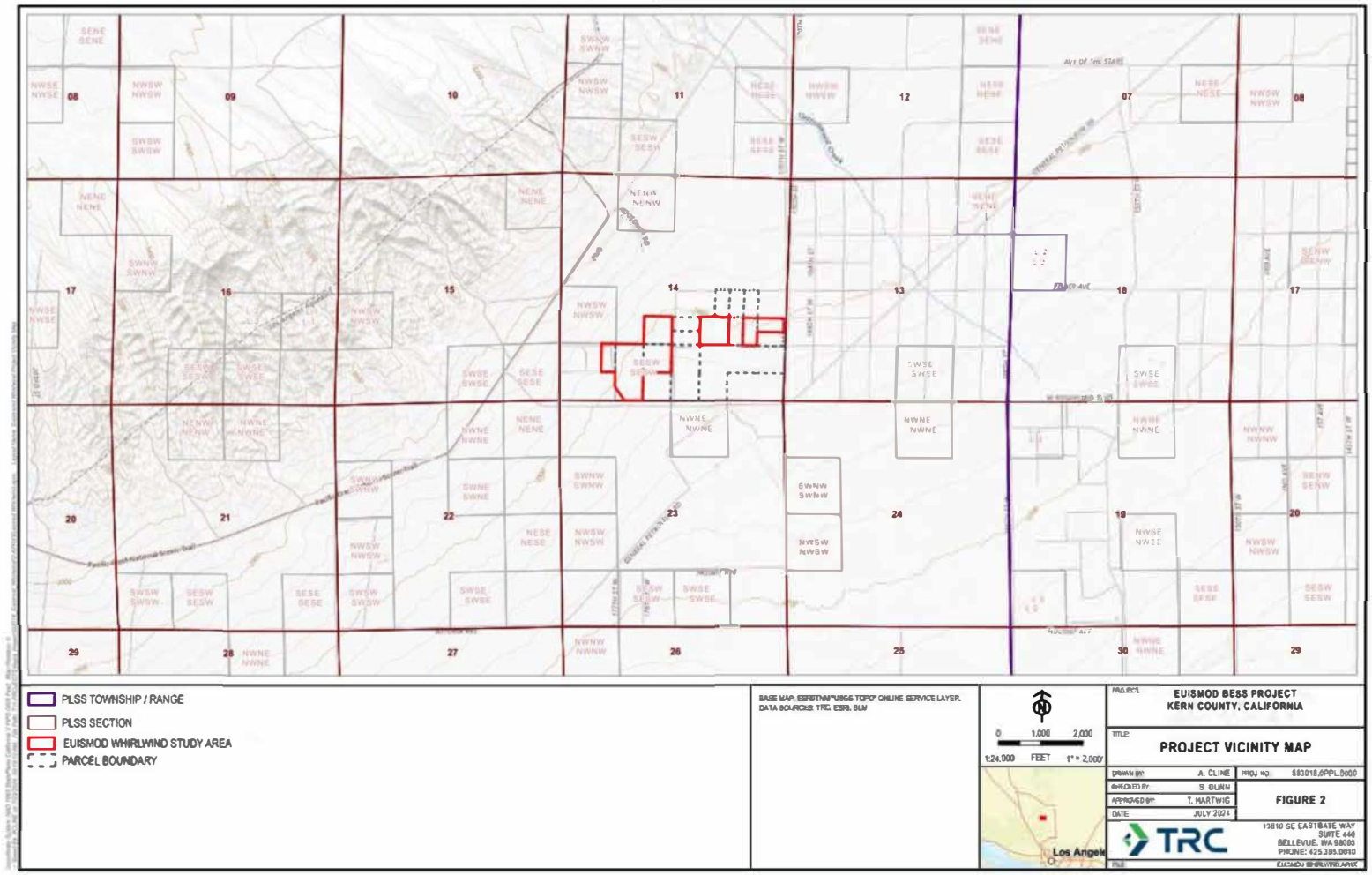


Figure 2: Project Vicinity, Aerial Map

1.2 Setting

The Study Area is located in the Antelope Valley area of the Mojave desert, about 15 miles west of Rosamond, CA (Figure 1). It is comprised of nine parcels and a surrounding 50-foot buffer that extend west from near 170th St West and Rosamond Boulevard. Figure 3 provides an aerial view of the Study Area. The Southern California Edison (SCE) Whirlwind Substation is located approximately 350 meters south at closest approach. The region is in the shadow of the Tehachapi Mountains, which lie to the northwest. There is an existing wind energy generation facility to the northeast. To the south, patches of native desert community intermingle with solar panels, agriculture, disturbed (ruderal) land, and sparsely distributed rural residences.

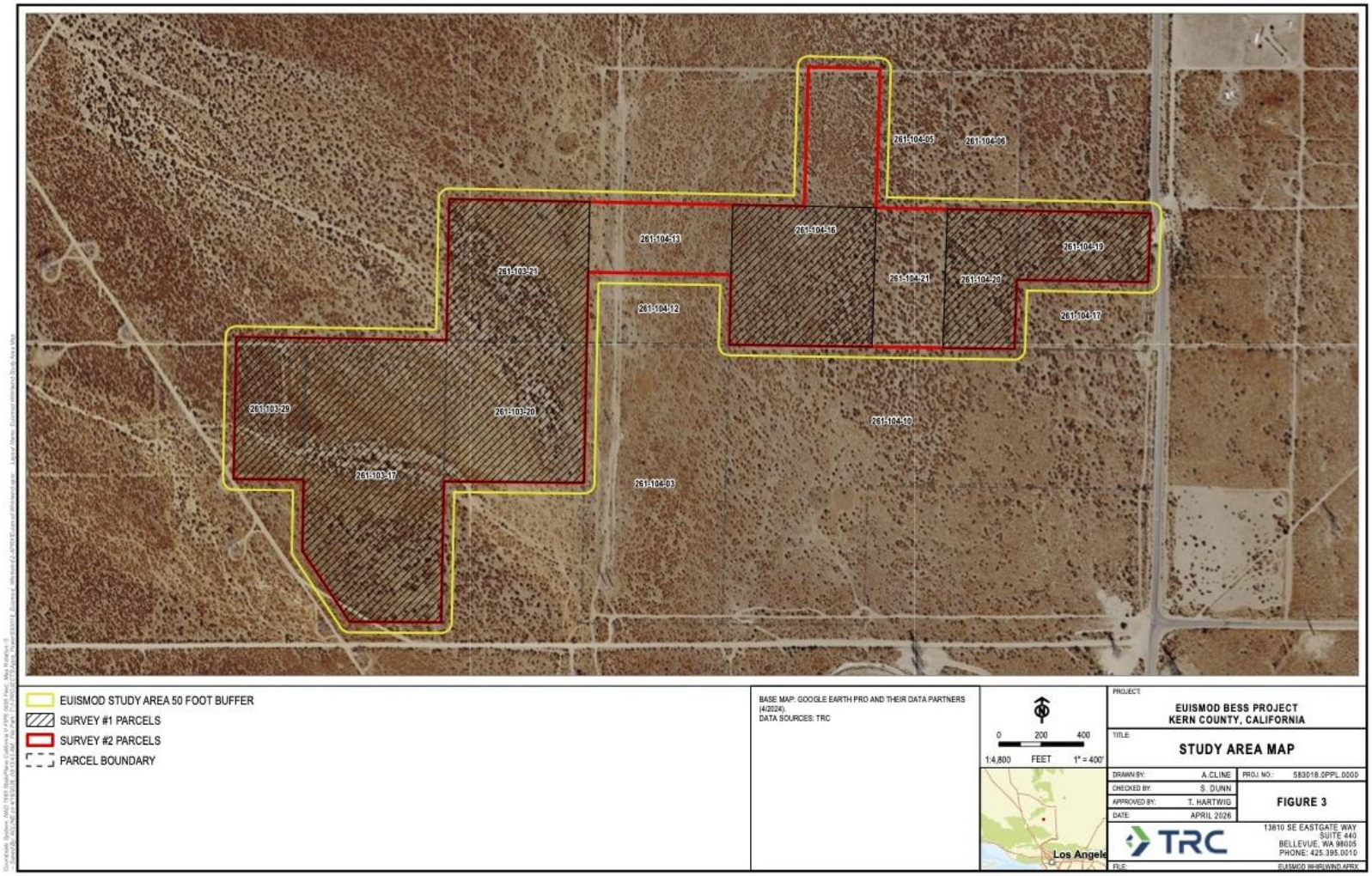


Figure 3. Study Area – early May (survey #1) & late May (survey #2)

2.0 Regulatory Requirements

The following federal and state regulatory requirements may be relevant to the project.

2.1 Federal Regulations

The following sections describe the federal regulations that may be relevant to the project in the context of rare plants.

2.1.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires federal agencies to review the effects that their actions would have on the environment prior to taking action. It requires all federal agencies to consider the direct, indirect, and cumulative effects of proposed actions and reasonable alternatives prior to making a decision. NEPA requires that all federal actions that could result in a significant effect on the environment to be subject to review by federal agencies with discretion over the action. If the Project requires any federal permits, NEPA may apply.

2.1.2 Federal Endangered Species Act (ESA)

The Endangered Species Act of 1973 (ESA) protects plants and animals that are listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Section 9 of ESA prohibits the taking of endangered wildlife, where taking is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct” (50 Code of Federal Regulations [CFR] 17.3). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any endangered plant on federal land and removing, cutting, digging up, damaging, or destroying any endangered plant on nonfederal land in knowing violation of state law (16 USC 1538). Under Section 7 of ESA, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect a listed (or proposed) species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion, the USFWS may issue an incidental take statement allowing take of the species that is incidental to an otherwise authorized activity provided the activity will not jeopardize the continued existence of the species. Section 10 of the ESA provides for issuance of incidental take permits provided a habitat conservation plan is developed.

2.2 State Regulations

The following state regulations may be relevant to the project in the context of rare plants.

2.2.1 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires State and local agencies to review the effects of their actions on the environment prior to acting on a project unless exempted. It requires that significant environmental impacts, including significant impacts to biological resources, be mitigated to a level that is less than significant, or to the maximum extent practical if the significant impact cannot be mitigated to a level that is less than significant. CEQA is codified in California Public Resources Code Section 21000 *et seq.* and supporting environmental review guidelines are codified in California Code of Regulations Title 14 Section 15000 *et seq*.

2.2.2 California Fish and Game Code

2.2.2.1 California Endangered Species Act (CESA)

The California Endangered Species Act (CESA) generally parallels the main provisions of the ESA, but unlike its federal counterpart, CESA applies the take prohibitions to species proposed for listing (called “candidates” by the state). Section 2080 of the California Fish and Game Code prohibits the taking, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or in the regulations. Take is defined in Section 86 of the Fish and Game Code as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.” CESA allows for take incidental to otherwise lawful development projects. State lead agencies are required to consult with California Department of Fish and Wildlife (CDFW) to ensure that any action they undertake is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat.

2.2.2.2 Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 (Fish and Game Code Sections 1900-1913) was created with the intent to “preserve, protect and enhance rare and endangered plants in this state.” The NPPA is administered by CDFW. The Fish and Wildlife Commission has the authority to designate native plants as “endangered” or “rare” and to protect endangered and rare plants from take. The CESA of 1984 (Fish and Game Code Section 2050-2116) provided further protection for rare and endangered plant species, but the NPPA remains part of the Fish and Game Code.

2.2.2.3 Streambed Alteration Agreement

Section 1602 of the Fish and Game Code requires that a Streambed Alteration Application be submitted to CDFW for “any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake.” The CDFW reviews the proposed actions and, if necessary, submits to the Applicant a proposal for measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by CDFW and the Applicant is the Streambed Alteration Agreement.

2.2.3 Western Joshua Tree Conservation Act (WJTCA)

The Western Joshua Tree Conservation Act (WJTCA) was enacted into California Law in July 2023, and prohibits the importation, export, take, possession, purchase, or sale of any western Joshua tree in California unless authorized by CDFW. The act authorizes CDFW to issue permits regarding mitigation efforts (specified fees may apply) for the incidental take of one or more western Joshua trees if the permittee meets certain conditions. In addition, the removal of dead western Joshua trees and the trimming of live western Joshua trees may also be authorized by CDFW under certain circumstances.

3.0 Methods

3.1 Desktop Review

Prior to conducting the field survey, TRC biologists compiled assessments from previous reports (TRC 2023, TRC 2024) to review the special status species and habitats that have been documented in the project vicinity and their habitat needs compared to habitat characteristics at the Site. The desktop review included information gathered from the following sources:

- USFWS Information for Planning and Consultation (IPaC) online tool
- California Natural Diversity Data Base (CNDDB)
- California Native Plant Society (CNPS) Inventory of Rare Plants
- Google Earth aerial imagery
- US Geological Survey (USGS), The National Map (TNM) National Hydrology Dataset (NHD)
- Natural Resources Conservation Service (NRCS) Web Soil Survey
- USFWS Wetland Mapper, National Wetlands Inventory (NWI) online map
- Jepson eFlora Project (eds.)
- Calflora Database
- iNaturalist Observations

Based on the previous reports, a list of special status plant species with potential to occur in the Study Area was compiled. For the purposes of this evaluation, special status species are defined as plants that:

- Have been designated as either species of special concern, threatened, endangered, or fully protected by USFWS or the State of California;
- Are candidate species being considered or proposed for listing under the ESA or CESA;
- Are designated as sensitive by the California Native Plant Society (CNPS).

The habitat preferences and distributional range of each species from the database queries were evaluated by desktop assessment for potential occurrence in the proposed Study Area or its vicinity. Results of desktop evaluations and pedestrian survey observations of species and habitats, sensitive species were assessed for potential to occur within the Study Area based on the following guidelines:

Present: Species has been observed in the Study Area during field surveys or recorded in the Study Area in the recent past.

High: All or many habitat elements meeting the species' requirements are present and/or the species has been recorded in the vicinity of the Study Area.

Moderate: Some habitat elements meeting the species' requirements are present and/or the species has been recorded in the vicinity of the Study Area. Area

Low: Few of the habitat elements meeting the species' requirements are present, and/or habitat elements present are sub-marginal. Species has been recorded in the vicinity of the Study Area.

Presumed Absent: Species not observed in the Study Area or in similar habitat in the vicinity in the recent past and habitat in the Study Area does not meet species' requirements.

3.2 Biological Survey

TRC biologists Tanessa Hartwig and Sydnee Dunn conducted two rare plant surveys, the first occurring April 30th, May 1st, and May 3rd and the second on May 29th and 30th, 2024. The timing of the survey period coincided with the blooming periods of the targeted rare plant species, especially those with a higher chance of occurring in the Study Area. The biologists walked meandering transects within the Study Area, visually scanning the landscape for novel plant species, paying particularly close attention to areas that included dry drainage beds. All observation records (date, time, GPS points, photos, and species observed) were collected on a Geode-equipped Samsung tablet and/or iPhone for sub-meter accuracy. A 10x magnifier was used as necessary to identify plants. Any wildlife observed during the survey was recorded; however, wildlife observations were incidental to the plant survey. The survey included the following:

- Recording plant and animal species observed;
- Observing for the possible presence of special status plant species;
- Evaluating habitat for special status plant species;
- Characterizing vegetation communities and land cover types; and
- Taking photographs of the site.

Vegetation was identified using a dichotomous key (Baldwin et al. 2002) or field guides (e.g., Rundel et al. 2022, Sawyer et al. 2009). Vegetation nomenclature is after the Jepson eFlora (2024). Additionally, all unidentified species were documented, photographed, and/or collected (depending on abundance of the species). Digital photographs of unidentified plant species encompassed the whole plant as well as any morphological structures/features that would be indicative of its identity. All plant species were identified down to the lowest taxonomic level possible.

Representative photographs are provided in Appendix A. Lists of plant species observed during the two rare plant surveys are provided in Appendix B. Any incidental animal species observed or detected during the field surveys are provided in Appendix C.

4.0 Results

Results of the desktop review and field surveys are described in the following sections, including area characteristics, vegetation communities, plants, special status species, and sensitive natural communities. Weather conditions during the survey are noted in Table 1. Weather data were gathered from weather station ID: KCALANCA106 in Lancaster, CA (Latitude/Longitude: 34.799° N, 118.585° W Elevation: 2907;).

Table 1: Survey Date, Times, and Conditions

Type of Survey	Date	Start Time	End TIme	Temperature – Average (˚F)	Approximate Cloud Cover (%)	Wind Speed – high/low (mph)
Pedestrian	April 30, 2024	9:00a.m.	1:30p.m.	62.6	10	25.9/1.8
Pedestrian	May 1, 2024	8:45a.m.	4:30p.m.	60.9	10	29.3/1.1
Pedestrian	May 3, 2024	7:00a.m.	12:45p.m.	65.6	0	24.6/0.9
Pedestrian	May 29, 2024	7:45a.m.	2:30p.m.	70.3	0	29.5/2.2
Pedestrian	May 30, 2024	6:15a.m.	10:15a.m.	75.3	0	21.9/0.0

4.1 Biological Study Area Characteristics

This section describes the environmental setting and special status plants observed during the survey.

4.1.1 Environmental Setting

The Study Area is located on alluvial slopes on the south side of the Tehachapi Mountain range at elevations of approximately 2760 to 2830 ft above mean sea level. The ground surface slopes gently to moderately in a northwest-southeast direction. The soils are predominantly sandy loams with slopes ranging from 2 to 9 Percent. Soil types within the Site as mapped by National Resources Conservation Services (NCRS) are shown in Table 2 (USDA 2024).

Table 2: Soil Types in the proposed Site

Soil Type	Abbreviation	Approx. % of Environmental Study Area	Hydric Soil
Cajon loamy sand, 2 to 9 percent slopes	CaC	51.12	No
Hesperia fine sandy loam, 2 to 5 percent slopes	HkB	40.28	No
Cajon loamy sand, 2 to 9 percent slopes	CaC	4.33	No
Rosamond fine sandy loam	Ro	4.27	Yes

Vegetation communities in the Study Area were mapped as creosote bush (*Larrea tridentata*) scrub alliance by the Desert Renewable Energy Conservation Plan (Menke et al. 2016), with Joshua tree (*Yucca brevifolia*) cover estimated to be less than 1 percent of the total ground cover. Previous biological resource surveys for the project (TRC 2023, TRC 2024) confirmed

that the Study Area is creosote bush scrub. Based on the lack of a central stem in most plants, the dominance of creosote, and the presence of well-spaced creosote "circles," the community appeared to be a mature creosote scrub community.

The creosote bush scrub community in the Study Area was dominated by creosote. The shrub community was open; shrubs were typically spaced 4- to 15-ft apart. Other shrubs observed within the Study Area predominantly included: rubber rabbitbrush (*Ericameria nauseosa),* winterfat (*Krascheninnikovia lanata*), cheesebush (*Ambrosia salsola*), and white bursage (*Ambrosia dumosa*). Native herbs predominantly consisted of common goldfields (*Lasthenia gracilis*), doveweed (*Croton setiger*), sandblossoms (*Linanthus parryae*), whitemargin sandmat (*Euphorbia albomarginata*), and anglestem buckwheat (*Eriogonum angulosum*). Non-native herbs and grasses were also present, and predominantly included tumble mustard (*Sisymbrium altissimum*), redstem filaree (*Erodium cicutarium*), cheat grass (*Bromus tectorum*), and red brome (*Bromus madritensis* ssp. *rubens)*. The herb layer was very dense under shrub canopies. Appendix B provides a list of all vascular plant species observed during the two surveys.

4.2 Special Status Plants

The potential for special status plant species to occur within the Study Area is provided in Table 3. The species identified in Table 3 were compiled from CNDDB 5-mile radius queries (CDFW 2024a), the online USFWS IPaC tool (USFWS 2024a), and a 9-quad CNPS list of rare plants (CNPS 2024), CDFW's wildlife habitat relationship system tool (CDFW 2024b, TRC 2023, TRC 2024). Table 3 addresses the special status plant species identified as having potential habitat present during the desktop review, and the potential for the species to occur in the Study Area based on desktop review and field survey results.

Joshua tree (*Yucca brevifolia*), a Candidate for listing under the California Endangered Species Act (CDFW 2024c), was observed at multiple locations throughout the Study Area. No special status species other than Joshua tree were observed in the Study Area.

Two (2) special status species, Clokey's cryptantha (*Cryptantha clokeyi*) and Mojave spineflower (*Chorizanthe spinosa*), are judged to have moderate potential to occur within the Study Area during the desktop review. Neither species was observed during the surveys. However, both plants are small/low growing species that are difficult to observe even when hydrated. Clokey's cryptantha's bloom period peaks in April and the first survey occurred on April 30th, While the bloom period for Mojave spineflower does fall within the survey's timeline, many of the small/low growing plants observed were already dry or drying by the first survey.

Table 3: Potential Special Status Plants

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
alkali mariposa-lily (*Calochortus striatus*)	-- / -- / 1B.2	Chaparral; Chenopod scrub; Mojavean Desert scrub; Meadow & seep; Wetland - alkaline meadows and ephemeral washes. **Elevation:** 70-1600 m **Blooming period:** Apr-Jun	**Low:** Known to occur in the vicinity to the northeast. The majority of the site lacks potential for alkali soils needed to support this species; however, desert scrub habitat is present. Was not observed during either field survey.	7 occurrences are recorded within 15 miles of the site (Calflora 2026). The closest observation was recorded in 2010 approximately 10 miles east of from the site.
aparejo grass (*Muhlenbergia utilis*)	-- / -- / 2B.2	Chaparral; Cismontane woodland; Coastal scrub; Meadow & seep; Marsh & swamp; Ultramafic - sometimes alkaline, sometimes serpentinite. **Elevation:** 25-2325 m **Blooming period:** Apr-Jul	**Low**: The majority of the site lacks potential for alkali soils, and preferred habitats are not on Site. Known to occur in the foothills to the north. Was not observed during either field survey.	5 occurrences are recorded in the foothills approximately 9 miles from the site (CalFlora 2026). The observations occurred between 2007-2017.
Bakersfield cactus (*Opuntia basilaris* var. *treleasei*)	FE / SE / 1B.1	Chenopod scrub; Cismontane woodland; Valley & foothill grassland - coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats, within grassland. **Elevation:** 85-550 m **Blooming period:** Jan-Aug	**Low:** Well-drained granitic sandy loams on flats are located on site. However, preferred grassland or chenopod scrub habitats not observed on site and site is outside typical elevation range. Was not observed during either field survey.	3 occurrences are recorded in the foothills approximately 15 miles northeast of the site (CalFlora 2026). The observations were recorded in 1934 and 2009.
Clokey's cryptantha (*Cryptantha clokeyi*)	-- / -- / 1B.2	Mojavean Desert scrub - sandy or gravelly soils. **Elevation:** 750-1890 m **Blooming period:** (Mar)Apr	**Moderate:** This species primarily occurs on rocky to gravelly slopes or ridge crests; however, it has also been observed on relatively flat areas with gravelly soils in desert scrub habitat, which occurs onsite. It is also known to grow in the mountains and foothills to the southeast. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (CalFlora 2026). The closest observation was record in 2011, approximately 16 miles from the site.

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
Fort Tejon woolly sunflower (*Eriophyllum lanatum* var. *hallii*)	-- / -- / 1B.1	Chaparral; Cismontane woodland -often on slopes in loamy soils. **Elevation:** 1065-1435 m **Blooming period:** Feb-Apr(May)	**Presumed Absent:** Suitable habitat is not present on site and site is outside typical elevation, precipitation, and temperature range for this species. Was not observed during field survey.	4 occurrences are recorded within the foothills 10-15 miles northwest of the site (Calflora 2026). The closest observation was recorded in 2020, in the foothills approximately 10 miles northwest of the site at an elevation of 1872 m.
Greata's aster (*Symphyotrichum greatae*)	-- / -- / 1B.3	Broadleaved upland forest; Chaparral; Cismontane woodland; Lower montane coniferous forest; Riparian woodland - mesic canyons. **Elevation:** 335-2015 m **Blooming period:** Mar-May	**Presumed Absent**: Suitable forest or woodland habitat is not present and the Study Area is outside typical precipitation and temperature range for this species.. Was not observed during either field surveys.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
Horn's milk-vetch (*Astragalus hornii* var. *hornii*)	-- / -- / 1B.1	Alkali playa; Meadow & seep; Wetland - lake margins, alkaline sites. **Elevation:** 75-350 m **Blooming period:** Feb-Apr	**Presumed Absent:** Study Area is outside of the elevation range typical for this species and does not contain the salty flats or lake shore habitat preferred. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
inland gilia (*Gilia interior*)	-- / -- / 4.3	Cismontane woodland; Joshua tree woodland; lower montane coniferous forest; rocky sites. **Elevation:** 700-1700 m **Blooming period:** Mar-May	**Low:** Appears to prefer higher elevations. No known sightings beyond the Tehachapi mountains. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
Joshua tree (*Yucca brevifolia*)	-- / SC / --	Desert flats, slopes; Pollinated by the yucca moth *Tegeticula synthetica*. **Elevation:** 400--2300 m **Blooming period:** Mar-May	**Present:** Occurs throughout the Study Area. Density varies, but overall coverage is about 1% within the Study Area.	21 observations are recorded within 10 miles of the Project site, including within the site itself (CalFlora 2026). The most recent observation is from 2025, approximately 4.5 miles northwest of the site.

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
madera leptosiphon (*Leptosiphon serrulatus*)	-- / -- / 1B.2	Cismontane woodland; Lower montane coniferous forest - dry slopes; often on decomposed granite in woodland. **Elevation:** 80-1645 m **Blooming period:** Jul-Aug	**Presumed Absent:** Suitable cismontane woodland or lower montane coniferous forest habitat is not present on Site. Known to primarily occur in the mountains and foothills to the north of the Site where woodlands are present. The Site also lacks significant slopes. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
Mojave spineflower (*Chorizanthe spinosa*)	-- / -- / 4.2	Alkali playa; chenopod scrub; Joshua tree woodland; Mojavean Desert scrub; sometimes on alkaline soils. **Elevation:** 6-1300 m **Blooming period:** Mar-Jul	**Moderate:** Nearest known occurrences are 10 or more miles from the Study Area. However, Study Area conditions provide suitable habitat. Was not observed during either field survey.	Over 50 occurrences are recorded within 10-15 miles of the Project site (CalFlora 2026). The closest observations is from 2017 approximately 12 miles east of the site.
Peirson's lupine (*Lupinus peirsonii*)	-- / -- / 1B.3	Joshua tree woodland; Lower montane coniferous forest; Pinon & juniper woodlands; Upper montane coniferous forest - decomposed granite slide and talus, on slopes and ridges. **Elevation:** 1400-2380 m **Blooming period:** Apr-Jun	**Presumed Absent:** Suitable habitat is not present, and the Study Area occurs outside of the typical elevation range and lacks significant slopes preferred by this species. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
Peirson's morning-glory (*Calystegia peirsonii*)	-- / -- / 4.2	Chaparral; chenopod scrub; cismontane woodland; coastal scrub; lower montane coniferous forest; valley & foothill grassland; often in disturbed areas or along roadsides or in grassy, open areas. **Elevation:** 30-1500 m **Blooming period:** Apr-Jun	**Presumed Absent:** Suitable habitat is not present on Site. The Site lacks adequate precipitation and vegetation communities. No known occurrences in the vicinity. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
Robbins' nemacladus (*Nemacladus secundiflorus* var. *robbinsii*)	-- / -- / 1B.2	Chaparral; Valley & foothill grassland - dry, sandy, or gravelly slopes. openings. **Elevation:** 360-1710 m **Blooming period:** May-Jul	**Low:** Site contains suitable soils but lacks suitable vegetation communities. Was not observed during either field survey.	3 occurrences are recorded between 5-6 miles northeast of the site (CalFlora 2026). These observations were recorded in 2010.
salt spring checkerbloom (*Sidalcea neomexicana*)	-- / -- / 2B.2	Alkali playa; Chaparral; Coastal scrub; Lower montane coniferous forest; Mojavean Desert scrub; Wetland - alkali springs and marshes. **Elevation:** 3-2380 m **Blooming period:** Sep-May	**Low:** Study Area does not contain alkali springs or marsh habitat, prefers mesic habitats. However, desert scrub habitat does occur. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*)	-- / SE / 1B.1	Coastal scrub; Valley & foothill grassland - sandy soils. **Elevation:** 15-1015 m **Blooming period:** Jun-Sep	**Low:** Soils on Site are finer than what is typical, as sandy coastal scrub habitat is preferred. Not known to occur north of Los Angeles County. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
short-joint beavertail (*Opuntia basilaris* var. *brachyclada*)	-- / -- / 1B.2	Chaparral; Joshua tree woodland; Mojavean Desert scrub; Pinon & juniper woodlands – sandy soil or coarse, granitic loam. **Elevation:** 425-2015 m **Blooming period:** Apr-Jun (Aug)	**Presumed Absent:** Soil in the Site area is finer than the preferred soil texture. Not known to occur outside of Los Angeles and San Bernardino Counties. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
slender mariposa-lily (*Calochortus clavatus* var. *gracilis*)	-- / -- / 1B.2	Chaparral; Coastal scrub; Valley & foothill grassland – shaded foothill canyons; often on grassy slopes within other habitat. **Elevation:** 210-1815 m **Blooming period:** Mar-Jun (Nov)	**Presumed Absent:** The Site does not contain much shade or reside in the foothills or on grassy slopes habitat preferred. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
southern jewelflower (*Streptanthus campestris*)	-- / -- / 1B.3	Chaparral; Lower montane coniferous forest; Pinon & juniper woodlands – open, rocky areas. **Elevation:** 605-2590 m **Blooming period:** (Apr) May-Jul	**Presumed Absent:** The Site does contain some rocky substrate, but does not contain the preferred habitat; coniferous or pinon & juniper woodlands. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
spreading navarretia (*Navarretia fossalis*)	FT / -- / 1B.1	Alkali playa; Chenopod scrub; Marsh & swamp; Vernal pool; Wetland - San Diego hardpan and San Diego claypan vernal pools; in swales & vernal pools, often surrounded by other habitat types. **Elevation:** 15-850 m **Blooming period:** Apr-Jun	**Presumed Absent:** The Site does not contain alkali/claypan soils, nor does it contain any vernal pools or wetlands. Was not observed during either field survey.	2 observations are recorded approximately 8.5 miles south of the site (CalFlora 2026). These observations were recorded in 2010.
southern Sierra monardella (*Monardella linoides* ssp. *a nemonoides*)	-- / -- / 1B.3	Chaparral; Cismontane woodland; Lower montane coniferous forest - occurs usually in non-wetlands, occasionally in wetlands (low water tolerant). **Elevation:** 750-2000 m **Blooming period:** Jun-Aug	**Presumed Absent:** Chaparral, Cismontane woodland, and lower montane coniferous forest do not occur in the Site. Average temperatures and lows, mean precipitation, and soil pH are not within this species' typical range onsite. However, this species is known to occur along the foothills to the north of the Site. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).
Tehachapi monardella (*Monardella linoides* ssp. *oblonga*)	-- / -- / 1B.3	Lower montane coniferous forest; Pinon & juniper woodlands; Upper montane coniferous forest - on dry slopes of yellow pine forest, decomposed granitic soils; also, in roadside disturbed areas. **Elevation:** 1430-2655 m **Blooming period:** (May) Jun-Aug	**Presumed Absent:** The Site does not contain coniferous forest, Pinon & juniper woodlands, or yellow pine forests. The Site is also outside of the elevation range needed to support this plant species. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).

Species	Protection Status	Habitat Requirements	Potential To Occur*	Known Occurrences
Tejon poppy (*Eschscholzia lemmonii* ssp. *kernensis*)	-- / -- / 1B.1	Chenopod scrub; Valley & foothill grassland - little information available on habitat. **Elevation:** 135-1355 m **Blooming period:** (Feb) Mar-May	**Low:** Tends to prefer calcareous soils, which are not contained in the Site. Known sightings have occurred in the foothills to the northwest. However, open areas on site may provide some habitat. Was not observed during either field survey.	0 occurrences are recorded within 15 miles of the site (Calflora 2026).

Status Designations

Federal

FE Listed as Endangered under the federal Endangered Species Act

FT Listed as Threatened under the federal Endangered Species Act

State of California

SE California Fish and Game Code Endangered Species

ST California Fish and Game Code Threatened Species

SC California Fish and Game Code Candidate Species

FP California Fish and Game Code Fully Protected Species

SR California Fish and Game Code Rare Species

SSC California Department of Fish and Wildlife Species of Special Concern

California Rare Plant Rank (CRPR)

1A Plant assumed extinct in California

1B Plants rare, threatened, or endangered in California and elsewhere

2 Plants rare, threatened, or endangered in California, but more common elsewhere

3 Plants about which more information is needed

4 Plants of limited distribution

Threat Ranks

0.1-Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2-Fairly threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3-Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

Occurrence data was collected in April 2026 using the observation search from CalFlora. This database compiles observations from CalFlora, the Consortium of California Herbaria, the Consortium of North American bryophyte Herbaria, and I Naturalist.

*** Habitat information from:** www.calflora.org **(Calflora 2024) and** https://ucjeps.berkeley.edu/eflora/ **(Jepson 2024).**

5.0 Discussion and Recommendations

Approximately 6% of plant species observed during the surveys were observed only in a senesced (dried out) state (Appendix B). High-wind events during the surveys continued to dry plants and may have limited the identification of small/low-growing species, as they are difficult to observe even when they are fully hydrated. However, all species observed were identified at least to genus level. In addition, only three new species were identified during the second survey. The low number of new species identified during the second survey makes it likely that most species detectible at the time of the surveys were captured (i.e., fall-blooming species would not have been detected during spring surveys). Surveys were conducted during the blooming season of target species, particularly those with moderate potential to occur on the project site. Although, the surveys did occur near the end of the Clokey's cryptantha's bloom period. No rare plants were observed during either of these surveys other than Joshua tree (State Candidate).

To comply with environmental permitting and reduce project impacts, the following measures are recommended:

1. **Western Joshua tree census**. As a Candidate for listing, the tree provisionally receives the same protections as a state-listed endangered or threatened species. Although the western Joshua tree is still listed as a candidate species for listing, the passage of the Western Joshua Tree Conservation Act (WJTCA) into law in July 2023 prohibits the importation, export, take, possession, purchase, or sale of any western Joshua tree in California unless authorized by CDFW (WJYCA 2024c). The WJTCA also facilitates renewable energy and other critical projects by creating streamlined permitting options for the authorization of incidental take of western Joshua Tree. A first step in the permitting process is a western Joshua tree census, conducted according to CDFW guidelines.

2. **Pre-construction surveys for special status plants**. TRC recommends pre-construction surveys by a qualified biologist for sensitive plant species with potential to occur within the Study Area (i.e. Clokey's cryptantha and Mojave spineflower). Pre-construction surveys are typically conducted within seven days of the start of project activities.

6.0 References

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Appendix A

Site Photographs



Photo 1. April 30th, 2024, looking east. East of 170th St. W, near the northeast corner of Site (34.868011, 118.432269).



Photo 2. May 3rd, 2024, looking southwest. West of 170th St. W near northeast corner of Site. (34.867923, -118.432439).



Photo 3. May 1st, 2024, looking east.
North-most corner of Site (34.868003, -118.443620).



Photo 4. May 3rd, 2024, looking northwest. South Access Road, midway through parcel 261-104-20. (34.866223, -118.435213).



Photo 5. May 3rd, 2024, looking north-northwest. South access road, midway through parcel 261-104-16. Wind farm in background (34.866178, -118.437949).



Photo 6. May 3rd, 2024, looking north. South edge of Parcel 261-103-21, midway through. Wind farm in background (34.866263, -118.442608).



Photo 7. May 3rd, 2024, looking South along the east boundary of Parcel 261-103-20. Southeast corner of Parcel 261-103-21 (34.866308, -118.441183).



Photo 8. May 3rd, 2024, looking west. Southeast corner of Parcel 261-103-21 (34.866314, -118.441181).



Photo 9. May 3rd, 2024, looking west. South access road near southwest corner of Parcel 261-104-16 (34.866178, -118.438733).



Photo 10. May 3rd, 2024, looking west. Midway through west edge of Site, ephemeral streambed (34.865164, -118.446866).



Photo 11. May 3rd, 2024, looking east. Southwest corner of Parcel 261-103-29 (34.864322, -118.446981).



Photo 12. April 30th, 2024. Sandblossoms (*Linanthus parryae*) - flowering.



Photo 13. May 30th, 2024. Schott's calico (*Loeseliastrum schottii*) – flowering.



Photo 14. April 30th, 2024. Desert calico (*Loeseliastrum matthewsii*) – flowering, partiallly senecced.



Photo 15. May 1st, 2024. Anglestem buckwheat (*Eriogonum angulosum*) – senesced.



Photo 16. May 1st, 2024. Pale yellow suncup (*Camissoniopsis pallida*) – flowering.



Photo 17. May 1st, 2024. White bursage (*Ambrosia dumosa*) – senesced.

Appendix B

Plants Observed

Observed Plants, Euismod BESS Site, Kern County, CA. April 30-May 3 & May 29-30, 2024.

Family	Species	Common Name	Cal IPC^ or Special Status Rank	Flowering/ Fruiting/ Senesced	Survey identified
AGAVACEAE - AGAVE FAMILY	*Yucca brevifolia*	Joshua tree	State Candidate		Early May
ASTERACEAE - SUNFLOWER FAMILY	*Lasthenia gracilis*	common goldfields		flowering	Early May
ASTERACEAE - SUNFLOWER FAMILY	*Ericameria nauseosa*	rubber rabbit brush			Early May
ASTERACEAE - SUNFLOWER FAMILY	*Ambrosia salsola*	cheesebush			Early May
ASTERACEAE - SUNFLOWER FAMILY	*Ambrosia dumosa*	white bursage		flowering	Early May
ASTERACEAE - SUNFLOWER FAMILY	*Lactuca serriola**	prickly lettuce		Vegetative	Late May
ASTERACEAE - SUNFLOWER FAMILY	*Acamptopappus sphaerocephalus*	rayless goldenhead		flowering	Early May
ASTERACEAE - SUNFLOWER FAMILY	*Malacothrix glabrata*	smooth desert dandelion		flowering	Early May
ASTERACEAE - SUNFLOWER FAMILY	*Encelia actoni*	Acton's brittlebush		flowering	Early May
ASTERACEAE - SUNFLOWER FAMILY	*Uropappus lindleyi*	silver puffs		mostly senesced	Early May
BORAGINACEAE - BORAGE FAMILY	*Amsinckia tessalata*	tessellated fiddleneck		some flowering; mostly senesced	Early May
BORAGINACEAE - BORAGE FAMILY	*Cyptantha decipiens*	gravel cryptantha		flowering	Early May
BORAGINACEAE - BORAGE FAMILY	*Phacelia tanacetifolia*	Lacy phacelia		flowering	Early May

Family	Species	Common Name	Cal IPC^ or Special Status Rank	Flowering/ Fruiting/ Senesced	Survey identified
BRASSICACEAE - MUSTARD FAMILY	*Sisymbrium altissimum**	tumble mustard		mostly flowering; some senesced	Early May
CACTACEAE - CACTUS FAMILY	*Cylindropuntia echinocarpa*	silver cholla			Early May
CHENOPODIACEAE - GOOSEFOOT FAMILY	*Krascheninnikovia lanata*	winterfat			Early May
CURCURBITACEAE - GOURD FAMILY	*Marah macrocarpa*	large fruit wild cucumber			Early May
EPHEDRACEAE - EPHEDRA FAMILY	*Ephedra californica*	California ephedra		some flowering; some fruiting	Early May
EUPHORBIACEAE - SPURGE FAMILY	*Croton setiger*	turkey-mullein/doveweed		senesced	Early May
EUPHORBIACEAE - SPURGE FAMILY	*Euphorbia albomarginata*	whitemargin sandmat		flowering	Early May
FABACEAE - LEGUME FAMILY	*Lupinus microcarpus* var. *densiflorus*	chick lupine		flowering	Early May
FABACEAE - LEGUME FAMILY	*Astragalus lentiginosus* var. *variabilis*	freckled milkvetch		flowering; fruiting	Early May
GERANIACEAE - GERANIUM FAMILY	*Erodium cicutarium**	red-stemmed filaree	Cal IPC - Limited	flowering	Early May
LAMIACEAE - MINT FAMILY	*Salvia carduacea*	thistle sage		some flowering	Early May
MONTIACEAE - MINER'S-LETTUCE FAMILY	*Calyptridium monandrum*	common pussypaws			Early May
NYCTAGINACEAE - FOUR O'CLOCK FAMILY	*Mirabilis laevis*	wishbone plant		flowering	Early May
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissoniopsis pallida*	pale yellow suncups		flowering	Early May
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Castilleja exserta*	owl's clover		flowering	Early May

Family	Species	Common Name	Cal IPC^ or Special Status Rank	Flowering/ Fruiting/ Senesced	Survey identified
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Eremothera boothii*	Booth's evening primrose		flowering	Early May
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Eulobus californicus*	false mustard/California primrose		flowering	Early May
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissonia campestris*	Mojave suncup		flowering	Early May
ONAGRACEAE - EVENING PRIMROSE FAMILY	*Camissoniopsis hirtella*	hairy suncup		flowering	Early May
POACEAE - GRASS FAMILY	*Bromus tectorum**	cheat grass	Cal IPC - High	mostly senesced	Early May
POACEAE - GRASS FAMILY	*Stipa hymenoides*	Indian rice grass			Early May
POACEAE - GRASS FAMILY	*Bromus madritensis* ssp. *rubens**	red brome	Cal IPC - High	mostly senesced	Early May
POACEAE - GRASS FAMILY	*Hordeum murinum* spp. *glaucum**	smooth barley	Cal IPC - Moderate		Early May
POACEAE - GRASS FAMILY	*Festuca bromoides**	brome fescue		senesced	Early May
POACEAE - GRASS FAMILY	*Poa secunda*	one sided blue grass			Early May
POACEAE - GRASS FAMILY	*Schismus arabicus**	Mediterranean grass	Cal IPC - Limited	senesced	Early May
POACEAE - GRASS FAMILY	*Stipa speciosa*	Desert needle grass			Late May
POLEMONIACEAE - PHLOX FAMILY	*Eriastrum eremicum* spp. *eremicum*	desert woolly star		some flowering	Early May
POLEMONIACEAE - PHLOX FAMILY	*Gilia* sp.	gilia		flowering	Early May
POLEMONIACEAE - PHLOX FAMILY	*Linanthus parryae*	sandblossoms		mostly senesced; some flowering	Early May
POLEMONIACEAE - PHLOX FAMILY	*Loeseliastrum matthewsii*	desert calico		some flowering	Early May
POLEMONIACEAE - PHLOX FAMILY	*Loeseliastrum schottii*	Schott's calico		some flowering	Late May

Family	Species	Common Name	Cal IPC^ or Special Status Rank	Flowering/ Fruiting/ Senesced	Survey identified
POLEMONIACEAE - PHLOX FAMILY	*Leptosiphon liniflorus*	flax-flowered linanthus		flowering	Early May
POLYGONACEAE - BUCKWHEAT FAMILY	*Eriogonum angulasum*	angle-stem buckwheat		some flowering; some senesced	Early May
POLYGONACEAE - BUCKWHEAT FAMILY	*Chorizanthe brevicornu*	brittle spineflower			Early May
SOLANACEAE - NIGHTSHADE FAMILY	*Lycium cooperi*	peach box-thorn		mostly senesced; some flowering	Early May
SOLANACEAE - NIGHTSHADE FAMILY	*Lycium andersonii*	Anderson's box-thorn			Early May
ZYGOPHYLLACEAE - CALTROP FAMILY	*Larrea tridentata*	creosote bush		flowering	Early May

*non-native

^Cal IPC = California Invasive Plant Council

Cal IPC Ratings (from https://cal-ipc.org/plants/inventory)

High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate – These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited – These species are invasive, but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Appendix C

Wildlife Observed

Observed Wildlife, Euismod BESS Site, Kern County, CA. April 30 – May 3, 2024.

Scientific name	Common name
AVES	**BIRDS**
Accipitridae	**Raptors**
Buteo jamaicensis	red-tailed hawk
Caprimulgidae	**Nightjars**
Chordeiles acutipennis	lesser nighthawk
Columbidae	**Pigeons and doves**
Zenaida macroura	mourning dove
Corvidae	**Jays and crows**
Corvus corax	common raven
Fringillidae	**Finches**
Carpodacus mexicanus	house finch
Laniidae	**Shrikes**
Lanius ludovicianus^	loggerhead shrike^
Mimidae	**Mockingbirds and thrashers**
Mimus polyglottos	northern mockingbird
INSECTA	**INSECTS**
Coleoptera	**Beetles**
Tenebrionidae	Darkling beetles
Coelocnemis dilaticollis	California broad-necked darkling beetle
Meloidae	Blister Beetles
Cysteodemus armatus	inflated blister beetle
Lytta magister	master blister beetle
Hymenoptera	**Ants, Bees, and Wasps**
Apis mellifera	honey bee
Dasymutilla albiceris	velvet ant
Vespidae	Eusocial wasps
Vespula sp.	yellowjacket wasp
MAMMALIA	**MAMMALS**
Bovidae	**Bovids**
Ovis aries	domestic sheep
Heteromyidae	**Pocket mice, kangaroo rats**
Dipodomys merriami	Merriam's kangaroo rat (dead)
Leporidae	**Hares and rabbits**
Lepus californicus	black-tailed jackrabbit
Sciuridae	**Squirrels**
Ammospermophilus leucurus	white-tailed antelope ground squirrel
REPTILIA	**REPTILES**
Crotophytidae	**Crotophytids**
Gambelia wislizenii	long-nosed leopard lizard
Phrynosomatidae	**Phrynosomatids**
Uta stansburiana	side-blotched lizard
Teiidae	**Whiptail lizards**
Conidiophores tigris	Western whiptail

^ CDFW Species of Special Concern

* Non-native species

Rare Plant Survey at the Proposed Euismod Project, Willow Springs, Kern County, California Spring 2025

Prepared for:

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May 2025

EXECUTIVE SUMMARY

A protocol-level rare plant survey was conducted in early May 2025 by Aardvark Biological Services, LLC at the proposed Euismod Project in Willow Springs in Kern County, California. The purpose of the survey was to:

- Document the occurrence of special status plants.
- Document any invasive species located within the Project Area.
- Identify and map the occurrence of plants protected under the California Desert Native Plant Act (CDNPA).

The survey concluded with the following results:

- Western Joshua tree (*Yucca brevifolia*) is a special status species, a Candidate for Listing under the California Endangered Species Act and was observed throughout the Project site. There were no other occurrences of special status plant species located in the 120-acre Project Area nor in the approximately 7-acre gen-tie corridor.
- One invasive annual grass species, ripgut brome (*Bromus diandrus*), was located within the west gen-tie corridor in the ditch line surrounding the Southern California Edison Whirlwind Substation and along an adjacent drainage. This species is naturalized in California and therefore is not an invasive species of high priority but was mapped because it was not located elsewhere within the Project Area. It was only mapped inside the west gen-tie corridor but extends slightly further outside the corridor in low numbers.
- There were two plant species observed which are protected under the CDNPA. These included western Joshua tree (*Yucca brevifolia*) and silver cholla (*Cylindropuntia echinocarpa*). Western Joshua tree is also a State of California Candidate for Listing.

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B. Reference Site Photographs
C. Project Area Photographs

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Euismod Project (Project) is a proposed battery energy storage project (BESS) that will utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available such as from intermittent renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures. The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Whirlwind 220kV substation located approximately 100 meters to the south.

The Project will require permits from Kern County and other agencies that will require environmental review pursuant to the California Environmental Quality Act (CEQA). The survey documented in this report was conducted to provide information to support the CEQA review. The purpose of the survey is to determine if any threatened or endangered plant species or other special status species occur in the Project Area and to evaluate the existing habitats for their potential in supporting any sensitive species that may not be present or observable during the time of the survey. This report describes the methods and results of a protocol-level rare plant survey of the Project Area that was conducted in Spring 2025.

1.2 STUDY AREA DESCRIPTION

The Project Area is located in the west Mojave Desert in the Willow Springs area, west of Rosamond in Kern County, California (Figure 1-1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The Project Area is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. It lies north of the Southern California Edison (SCE) Whirlwind Substation, is bordered to the east by 170th Street West, to the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Project Area where it continues as a dirt road, and half of the Project Area is bordered to the north by an unnamed dirt road (Figures 1-1, 1-2). There are solar installations to the south and east of the Project Area and a wind farm to the northeast. The Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle). The cadastral description of the Project is as follows:

- Township 9N, Range 15W – a portion of the south half of Section 14.

Selected representative photographs for the Project Area are provided in Appendix C.

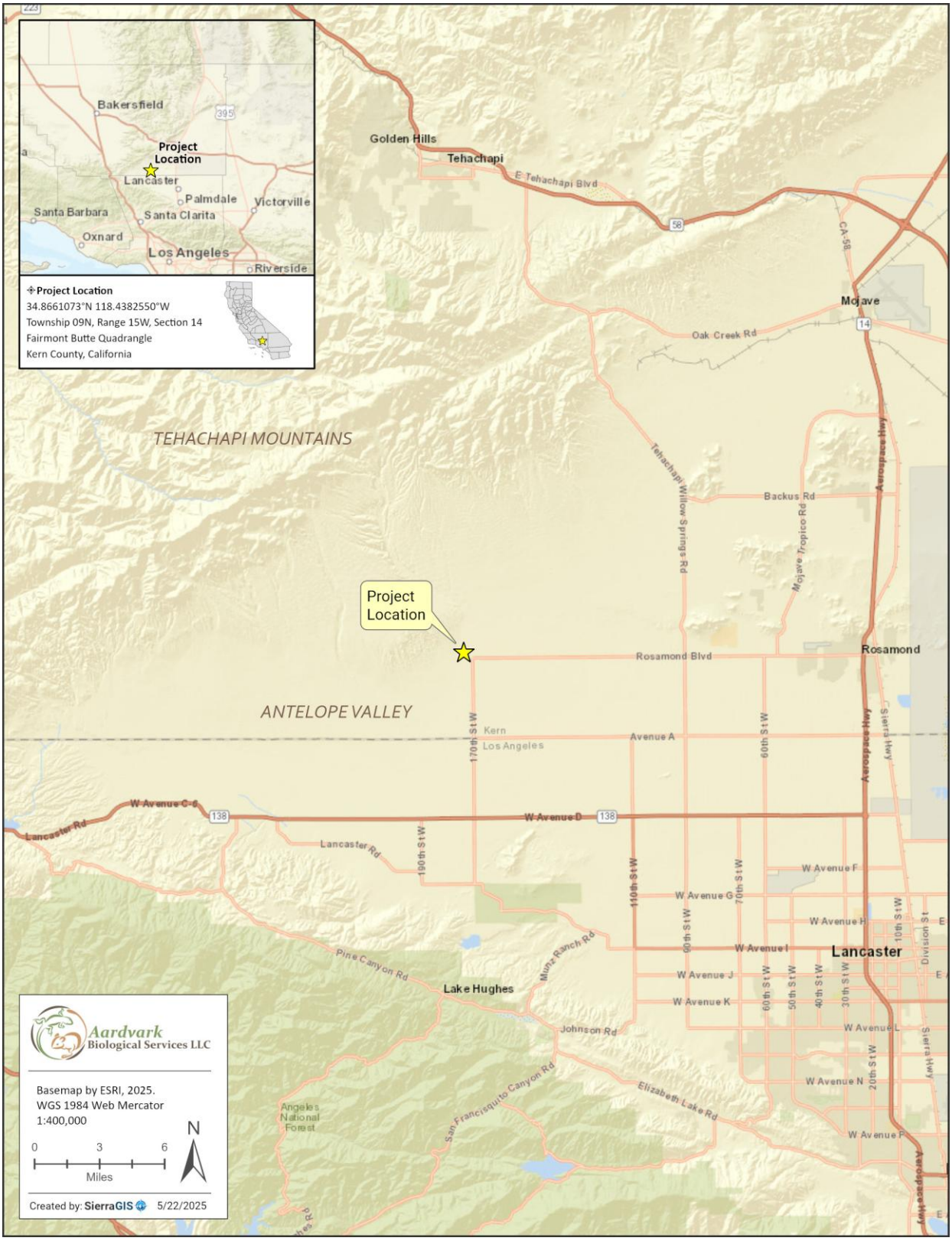


Figure 1-1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, CA

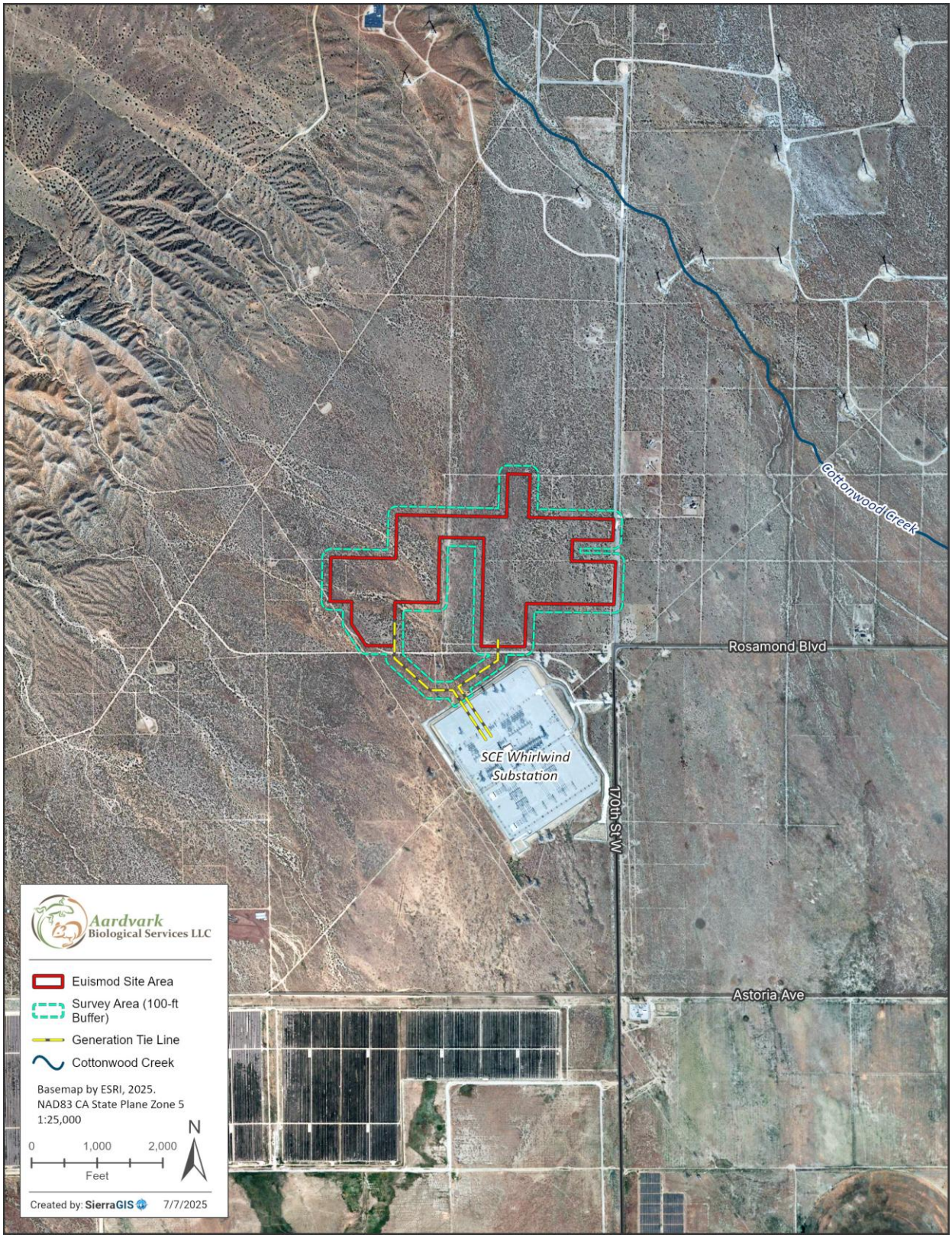


Figure 1-2. Proposed Euismod Project, Project Area Location Map, Willow Springs, Kern County, CA

1.3 SUMMARY OF DATABASE SEARCH

The database search conducted for special status plant species identified a total of 29 species within the USGS quadrangles in and around the Project Area (Figure 1-3; CNDDB 2025a, 2025b). Out of the 29 species identified, 15 species, listed below, had some potential to occur within the Project Area based on habitat, elevation, and proximity of known locations (geographic range) to the Project, prior to actual surveys:

Federal or California Rare, Threatened, or Endangered Species, or Candidates for Listing

- western Joshua tree (*Yucca brevifolia*)

California Rare Plant Rank (CRPR) 1B (rare and endangered in California and elsewhere)

- Horn's milk-vetch (*Astragalus hornii* var. *hornii*),
- Lancaster milk-vetch (*Astragalus preussii* var. *laxiflorus*),
- alkali mariposa-lily (*Calochortus striatus*),
- Clokey's cryptantha (*Cryptantha clokeyi*),
- desert cymopterus *(Cymopterus deserticola*),
- recurved larkspur (*Delphinium recurvatum*),
- Rosamond eriastrum (*Eriastrum rosamondense*).

CRPR 4 (watch list of plants with limited distribution)

- Peirson's morning glory **(***Calystegia peirsonii*),
- Kern County evening primrose (*Camissonia kernensis ssp. kernensis*),
- white pygmy-poppy (*Canbya candida*),
- Mojave paintbrush (*Castilleja plagiotoma*),
- Mojave spineflower (*Chorizanthe spinosa*),
- crowned muilla (*Muilla coronata*),
- San Joaquin bluecurls *(Trichostema ovatum*).

A description of each species and its potential for occurring in the Project Area is provided in 3.3 Rare Plants and summarized in Table 1-1. The potential for occurrence was finalized after the 2025 rare plant surveys were completed, which determined whether microhabitats that could support any of these special status species existed in the Project Area. No federally-listed endangered species was determined to have potential of occurring in the Project Area. Western Joshua tree (*Yucca brevifolia*), a California candidate species for listing as threatened, and therefore a special status species, was found to have potential to occur in the Project Area and was observed during the survey and during prior surveys. A complete census of this species was conducted by others in 2024 and reported separately (Turner and Young, 2024). Therefore, western Joshua tree will not be discussed in detail in this report.

The database search also identified taxa protected under the California Desert Native Plant Act (CDNPA), Division 23 of the California Food and Agricultural Code, Section 80071-80075 (California Food and Agricultural Code 2005) that potentially occur in the Project Area. These species are:

- golden cholla (*Cylindropuntia echinocarpa*),
- beavertail cactus (*Opuntia basilaris* var. *basilaris*), and
- western Joshua tree (*Yucca brevifolia*).

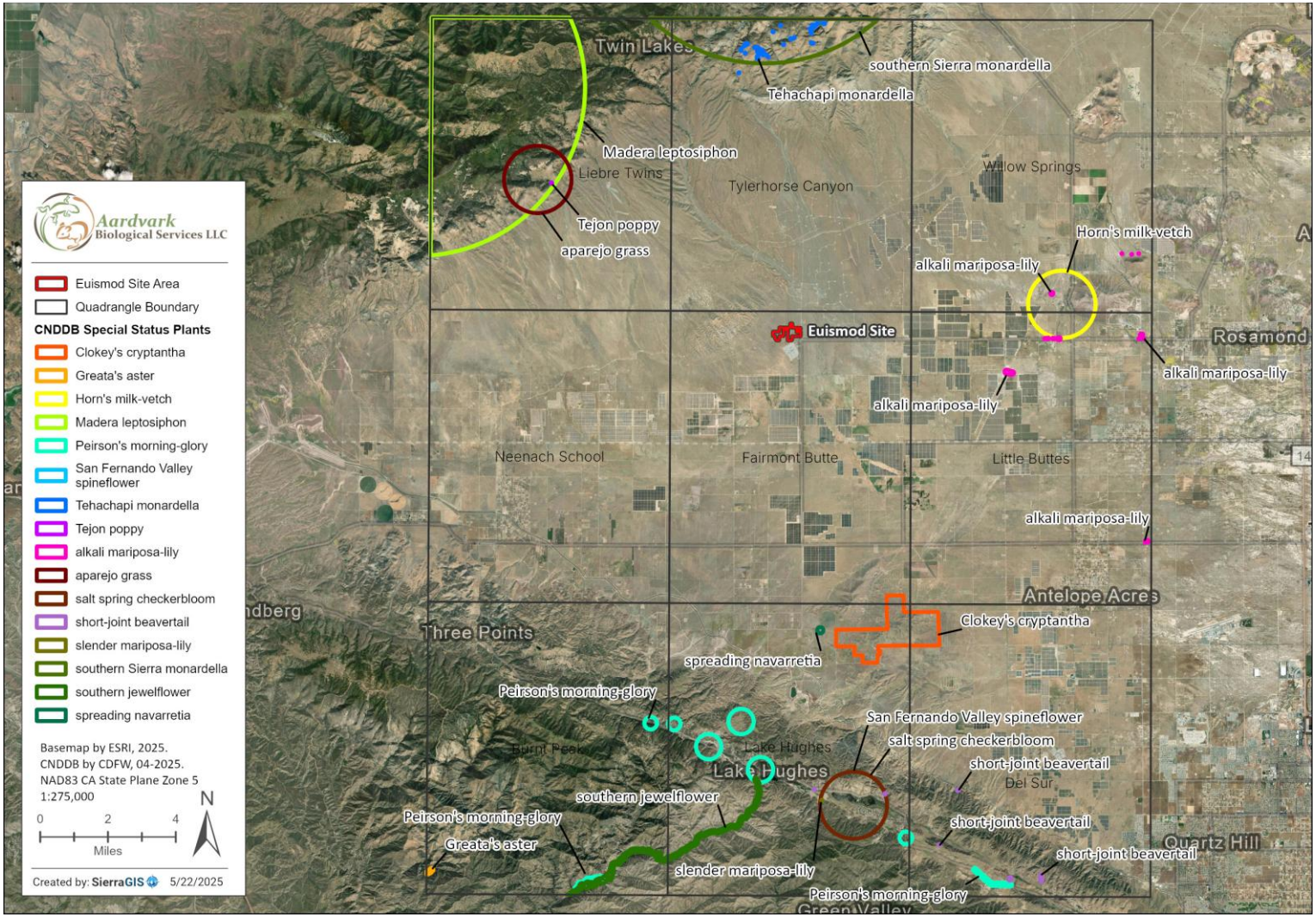


Figure 1-3. Proposed Euismod Project Area Special Status Plants, CNDDB Search Results, Willow Springs, Kern County, CA

Table 1-1. Special status plant species known to occur in the region and their occurrence potential within the Proposed Euismod Project Area, Willow Springs, Kern County, California[1]

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2]				FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
	FEDERAL/ STATE	G-RANK	S-RANK	CRPR			
Federal or California Rare, Threatened, or Endangered Species							
Chorizanthe parryi* var. *fernandina **San Fernando valley spineflower** Polygonaceae, annual herb	SE	G3	S1	1B.1	April-July	150-1220 m. Sandy. Coastal scrub, Valley and foothill grasslands.	**NONE** – In a different geographic range and habitat than the Project Area. Known from the Western Transverse Range in habitat types not found in the Mojave Desert.
Navarretia fossalis **spreading navarretia** Polemoniaceae, annual herb	FT	G2	S2	1B.1	April-June	30-655 m. Alkaline soil. Chenopod scrub, marshes and swamps (shallow freshwater), playas and vernal pools.	**NONE –** Known to occur from western Lancaster, growing in seasonal depressions that collect runoff. Habitat not found in the Project Area.
Yucca brevifolia **Western Joshua Tree** Agavaceae, tree	SC	-	-	-	March-June	400-2300 m. Desert flats and slopes.	**PRESENT** – Known from the Project Area. Occurs sporadically throughout site.
CRPR Rank 1B							
Astragalus hornii* var. *hornii **Horn's milk-vetch** Fabaceae, annual herb	-/-	G1	S1	1B.1	May-October	60-850 m. Lake margins, alkaline; meadows and seeps, playas.	**NONE** – Known sites west and south of Rosamond. May occur on and around alkaline playas and meadows, seeps and springs – habitat types not found in the Project Area.
Astragalus preussii* var. *laxiflorus **Lancaster milk-vetch** Fabaceae, perennial herb	-/-	G4	S1	1B.1	March-May	± 700 m. Alkaline flat. Chenopod scrub. Known only from near Lancaster and Edwards AFB.	**NONE** – Known sites east and south of Rosamond. May occur on alkaline flats in chenopod scrub – a habitat not found in the Project Area.
***Calochortus clavatus* var. gracilis** **slender mariposa-lily** Liliaceae, perennial bulbiferous herb	-/-	G4	S2S3	1B.2	May-June	320-1000 m. Chaparral, coastal scrub, valley and foothill grasslands.	**NONE** – In a different geographic range and habitat than the Project Area. Known from the Western Transverse Range and San Gabriel Ranges in coastal scrub/chaparral and valley grassland.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2]				FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
	FEDERAL/ STATE	G-RANK	S-RANK	CRPR			
Calochortus striatus **alkali mariposa-lily** Liliaceae, perennial bulbiferous herb	-/-	G3	S2S3	1B.2	April-June	70-1595 m. Alkaline, mesic. Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps.	**NONE** – Known to occur in the Rosamond vicinity in alkaline habitats which are not found in the Project Area.
Cryptantha clokeyi **Clokey's cryptantha** Boraginaceae, annual herb	-/-	G3	S3	1B.2	April	850-1650 m. Rocky to gravelly slopes, ridge crests, granite, rhyolite, or schist, desert woodland, chaparral.	**POSSIBLE** – Known occurrences south of Lancaster, in annual grassland with coarse sandy-gravelly soil. There is annual grassland habitat within the creosote scrub in the Project Area.
Cymopterus deserticola **desert cymopterus** Apiaceae, perennial herb	-/-	G2	S2	1B.2	March-May	630-1500 m. Sandy. Joshua tree woodland, Mojavean desert scrub.	**NONE** – Loose sandy soils, mainly north of SR58, but one 1932 collection east of Rosamond on Edwards Air Force Base. Sandy soils not found in Project Area.
Delphinium recurvatum **recurved larkspur** Ranunculaceae, perennial herb	-/-	G2	S2	1B.2	March-June	3-790 m. Alkaline. Chenopod scrub, cismontane woodland, valley and foothill grassland. Known to occur in the vicinity of Rosamond.	**NONE** – Chenopod scrub (saltbush and winter fat scrub) with alkaline soils. Known to occur in the vicinity of Rosamond. Alkaline, chenopod scrub habitat not found in Project Area.
Eriastrum rosamondense **Rosamond eriastrum** Polemoniaceae, annual herb	-/-	G1	S1	1B.1	April-May	700-715 m. Alkaline hummocks, often sandy. Chenopod scrub (openings), vernal pools (edges). Known only from Rosamond and Rogers Dry Lake areas.	**NONE –** In areas surrounding alkali clay pans. Known to occur in the vicinity of Rosamond. Habitat not found in Project Area.
Eschscholzia lemmonii* ssp. *kernensis **Tejon poppy** Papaveraceae, annual herb	-/-	G5	S2	1B.3	March-May	160-1000 m. Generally in loose calcareous soils. Chenopod scrub, Valley and foothill grasslands, open grasslands.	**NONE** – Known to occur in the western Tehachapi Mountain Area in open grassland often in calcareous soil. Outside the geographic range and habitat from the Project Area.
Layia heterotricha **pale-yellow layia** Asteraceae, annual herb	-/-	G2	S2	1B.1	March-June	300-1705 m. Alkaline or clay. Cismontane woodland, coastal scrub, pinyon and juniper	**NONE** – On clay or alkaline soils west of SR14 and north of Mojave, in the southern Sierra Nevada

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2]				FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
	FEDERAL/ STATE	G-RANK	S-RANK	CRPR			
						woodland, valley and foothill grassland. Occurrences northwest of Mojave.	foothills, Tehachapi Mountain area, San Joaquin Valley, Inner and Outer South Coast Ranges and Western Transverse Ranges. Outside the geographic range and habitat from the Project Area.
Leptosiphon serrulatus **Madera leptosiphon** Polemoniaceae, annual herb	-/-	G3	S3	1B.2	April-May	300-1300 m. Often on decomposed granite. Cismontane woodland, lower montane coniferous forests. Openings in woodland, chaparral.	**NONE** – Known from the southern Sierra Nevada foothills and mountains. Outside the geographic range and habitat from the Project Area.
Monardella linoides* ssp. *anemonoides **Southern Sierra monardella** Lamiaceae, perennial herb	-/-	G5	S2	1B.3	June-August	670-2450 m. Chaparral, cismontane woodland, lower montane coniferous forests.	**NONE** – Known from the southern Sierra Nevada foothills and mountains. Outside the geographic range and habitat from the Project Area.
Monardella linoides* ssp. *oblonga **Tehachapi monardella** Lamiaceae, perennial herb	-/-	G5	S2	1B.3	June-August	900-2470 m. Lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland.	**NONE** – Known from the southern Sierra Nevada foothills and mountains. Outside the geographic range and habitat from the Project Area.
Opuntia basilaris var. brachyclada **short-joint beavertail** Cactaceae, shrub (stem succulent)	-/-	G5	S3	1B.2	April-June	425-1800 m. Chaparral, Joshua tree woodland, Mojavean desert scrub, and pinyon and juniper woodland.	**NONE –** Known to occur to the south and west of Lancaster, in the San Gabriel Mountains and San Bernardino Mountains. Outside the geographic range of this Project Area.
Streptanthus campestris **southern jewelflower** Brassicaceae, perennial herb	-/-	G3	S3	1B.3	April-June	900-2300 m. Rocky. Open, rocky conifer forest, Chaparral, and pinyon and juniper woodland.	**NONE –** Known to occur to the south (southeast) and west of Lancaster, in the San Gabriel, San Bernardino, and San Jacinto Mountains, and the Western Transverse and Peninsular Ranges. Outside the geographic range and habitat of the Project area.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2] FEDERAL/ STATE	G-RANK	S-RANK	CRPR	FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
Symphyotrichum greatae **Greata's aster** Asteraceae, perennial herb	-/-	G2	S2	1B.3	June-October	300-2010 m. Mesic. Damp places in canyons, Broadleaved upland forest, chaparral, cismontane woodland, lower montane coniferous forest, riparian woodland.	**NONE** – Known from the San Gabriel Mountains (south slope). Project Area is not mesic nor with woodland or canyon habitats. Outside the geographic range and habitat of the Project Area.
CRPR Rank 2B							
Muhlenbergia utilis **Aparejo grass** Poaceae, perennial grasslike herb	-/-	G4	S2	2B.2	March-October	25-2325 m. Alkaline or serpentine soils. Chaparral, cismontane woodland, coastal scrub, marshes and swamps and meadows and seeps.	**NONE** – In a different geographic range and habitat than the Project Area. Known from the South Coast Ranges and Western Transverse Range in habitats types not found in the Mojave desert.
Sidalcea neomexicana **salt spring checkerbloom** Malvaceae, perennial herb	-/-	G4	S2	2B.2	March-June	15-1530 m. Alkaline springs. Mesic. Coastal sage scrub, creosote bush scrub, alkali sink, yellow pine forest, chaparral, wetland-riparian.	**NONE –** Several collections west of Lancaster. Within the geographic range, but this species is known from mesic and often alkaline environments which are not found in the Project Area.
CRPR Rank 4							
Camissonia kernensis **ssp. *kernensis*** **Kern County evening-primrose** Onagraceae, annual herb	-/-	G4	S3	4.3	March-May	790-2130 m. Sandy or gravelly, granitic. Chaparral, Joshua tree woodland, pinyon and juniper woodland. Known to occur in the vicinity of the Rosamond, closer to the town of Mojave.	**POSSIBLE**– In sandy or gravelly soils. Known to occur in the vicinity of the Rosamond.
Calystegia peirsonii **Peirson's morning glory** Convolvulaceae, perennial herb	-/-	G4	S4	4.2	April-June	30-1500 m. Rocky slopes. Chaparral, chenopod scrub, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland. Known to occur to the west of Lancaster.	**POSSIBLE** – Potential habitat in Project Area. In vicinity of Project Area.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2]				FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
	FEDERAL/ STATE	G-RANK	S-RANK	CRPR			
Canbya candida **white pygmy-poppy** Papaveraceae, annual herb	-/-	G3/ G4	S3S4	4.2	March-June	600-1460 m. Gravelly, sandy, granitic. Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Numerous occurrences in the Rosamond area.	**POSSIBLE** – Potential habitat, although soils in Project Area are a loamy sand or sandy loam. Known from Rosamond.
Castilleja plagiotoma **Mojave paintbrush** Orobanchaceae, perennial herb (hemiparasitic)	-/-	G4	S4	4.3	April-June	300-2500 m. Great Basin scrub (alluvial), Joshua tree woodland, lower montane coniferous forest, pinyon and juniper woodland. Known to occur in the vicinity of Rosamond and Lancaster.	**POSSIBLE** – Potential habitat in Project Area, and known from vicinity of Project Area.
Chorizanthe spinosa **Mojave spineflower** Polygonaceae, annual herb	-/-	G4	S4	4.2	March-July	600-1300 m. Alkaline, sandy/gravelly clay/hard pan. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, playas. Numerous occurrences in the Rosamond area. Skeletons of this species remain identifiable for several years after senescence.	**NONE** – Known from the Rosamond area. Neither alkaline clay pan, nor gravelly sandy hard pan habitat found in the Project Area.
Goodmania luteola **golden goodmania** Polygonaceae, annual herb	-/-	G3	S3	4.2	April-August	20-2200 m. Alkaline or clay. Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland. Numerous occurrences in the Rosamond area.	**NONE** – In clay or alkaline soils which are not present in the Project Area.
Muilla coronata **crowned muilla** Themidaceae, perennial bulbiferous herb	-/-	G3	S3	4.2	March-April	670-1960 m. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known to occur in the vicinity of Rosamond and Lancaster.	**POSSIBLE** – Potential habitat in the Project Area and known from Project Area vicinity.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[2]				FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	POTENTIAL FOR OCCURRENCE IN ROSAMOND, CA AREA
	FEDERAL/ STATE	G-RANK	S-RANK	CRPR			
Trichostema ovatum **San Joaquin bluecurls** Lamiaceae, annual herb	-/-	G3	S3	4.2	July-October	<300 m. Grassland, disturbed sites.	**POSSIBLE -** One 2017 occurrence west of Rosamond, roadside. Known from the southern San Joaquin Valley and the Western Transverse Range. Waif, likely imported with vehicles and equipment.

[1] Information taken from the California Natural Diversity Database (CNDDB) reports (CNNDB 2025a, 2025b); rank or status data checked in California Native Plant Society (CNPS 2025).

[2] Rank or status abbreviations:

FWS (U.S. Fish and Wildlife Service) listings under the Endangered Species: E=Endangered; T=Threatened; – = not listed or proposed for listing (FWS 2025).

CDFW (California Department of Fish and Wildlife) listings under California Endangered Species Act: E=Endangered; T=Threatened; R=Rare; C=Candidate Species for Listing; – = not listed or proposed for listing (CDFW 2025b).

G-Ranks (Global Ranks): G1=critically imperiled; G2=imperiled; G3=vulnerable; G4=apparently secure; G5=secure. Uncertainty about the rank of an element is expressed in two major ways: 1) by expressing the rank as a range of values: e.g., G2G3 means the rank is somewhere between G2 and G3; and 2) by adding a "?" to the rank: e.g., G2? This represents more certainty than G2G3, but less than G2 (CDFW 2025a, CNPS 2025).

CNDDB S-Ranks: S1= extremely endangered; S2= endangered; S3= restricted range, rare; S4= apparently secure; S5= demonstrably secure; SH= all Calif. Sites are historical. Uncertainty about the rank of an element is expressed in two major ways: 1) by expressing the rank as a range of values: e.g., S2S3 means the rank is somewhere between S2 and S3; and 2) by adding a "?" to the rank: e.g., S2? This represents more certainty than S2S3, but less than S2 (CDFW 2025a, CNPS 2025).

CRPR (California Rare Plant Rank): 1A=plants presumed extinct in California; 1B=plants rare and endangered in California and elsewhere; 2A=plants presumed extirpated in California but common elsewhere; 2B=plants rare, threatened, or endangered in California but more common elsewhere; 3=plants about which more information is needed – a review list; and 4=plants of limited distribution – a watch list. The number following Rank is the Threat Code: .1=seriously endangered in CA; .2=fairly endangered in CA; .3=not very endangered in CA. Plants with an "E" are endemic to CA (CNPS 2025).

2. METHODS

2.1 PRE-SURVEY INVESTIGATIONS

Botanists Cecile Shohet and Denise LaBerteaux reviewed the physical description, habitat description, drawings, and photographs of each potentially occurring special status plant species. Sources for information on each species included floras (Abrams and Ferris 1923-1960, Baldwin et al. 2012, Munz 1974), field guides (Jaeger 1940, MacKay 2013), and other sources (Bagley 2006; California Native Plant Society [CNPS] 1978; Charlton 1992; Smithsonian Institution 1978; University of California 2025). The botanist also developed a list of known locations for rare plants in the general vicinity of the Project based on California Natural Diversity Data Base (CNDDB) records (CNDDB 2025b) and from unprocessed CNDDB records in the vicinity of the Project Area. In addition, the California Native Plant Society Inventory of Rare Plants (CNPS 2025), the Consortium of California Herbarium (CH2 Portal 2025), and the Calflora Database (Calflora 2025) were also utilized to develop rare plant locations. Before initiating the protocol-level rare plant survey, one or both botanists, visited at least one location for each of the CRPR 1B plants to become familiar with its appearance, phenology and habitat and to determine if it would be identifiable at the time of the survey. The Mojave spineflower (*Chorizanthe spinosa*) a CRPR 4.2 plant was also visited as it was referenced in the 2024 Euismod Rare Plant Survey Report as having potential to have been missed because it may have been too dry to identify during the 2024 survey period.

2.2 PROTOCOL-LEVEL RARE PLANT SURVEY

Cecile Shohet and Denise LaBerteaux conducted the protocol-level rare plant survey in the Project Area from May 3 to May 5, 2025. The field survey consisted of a full coverage survey following protocols recommended by the CDFW (2018). The two botanists systematically walked 10-m, parallel line transects over the entire area to achieve full coverage. If any special status plant, invasive species, or CDNPA plant was encountered, its location was to be recorded on the GAIA GPS mobile application updated in 2025, version 2025.3. Data fields corresponding to the CNDDB Field Survey Form were to be recorded in a field notebook. Information collected for each special status plant was to be sent to the CNDDB.

The protocol-level rare plant survey was floristically based, that is, the botanist identified all plant species, whether fresh or dried, that was encountered in the Project Area to at least genus and to the level necessary to ensure that they were not plant species of concern. The botanist collected and later identified plants that were not readily identifiable in the field. Nomenclature throughout this report follows *Jepson eFlora* (Jepson Flora Project 2025).

3. RESULTS

3.1 REFERENCE SITE VISITS

Either one or both botanists visited the reference sites for the seven potentially occurring CRPR 1B plants, and in addition for one CRPR 4.2 plant, the Mojave spineflower. Reference site visits took place when the rare plant species in question was in the same geographic area as the Project Area, and when potential habitat existed in the Project Area. Rare plant surveys need to be complete prior to the botanists making the final determination whether habitat is present or absent for a particular rare plant species. Often microhabitats occur within larger vegetation communities that may support a particular rare plant species, and these microhabitats are not always visible in satellite or other imagery. The reference site visits occurred on April 30, 2025; May 3rd to May 5th 2025; and, May 10, 2025. The Mojave spineflower was included in the reference site visit because it had been discussed in the 2024 Euismod Rare Plant Survey Report as having potential to have been missed in the 2024 rare plant survey as it may have been too dry to identify. Selected representative photographs for the reference site visits are provided in Appendix B.

On April 30, 2025, Cecile Shohet searched for desert cymopterus at one known location, in the town of Boron, California, just south of downtown Boron and south of Boron Park in an area with loose sandy soils. Desert cymopterus was observed at this site in 2024 by Cecile Shohet, but was not seen in 2025, likely a factor of the dry year. The plant community consists of creosote bush – white bursage scrub (*Larrea tridentata-Ambrosia dumosa*) with box-thorn (*Lycium cooperi*), cheesebush (*Ambrosia salsola*), and Joshua trees (*Yucca brevifolia*). Sheep grazing was evidenced at this site in 2024 with its associated high intensity disturbance, resulting in an increase in non-native vegetation. Annual species located at this site included red-stemmed filaree (*Erodium cicutarium*), Mojave sun cup (*Camissonia campestris* ssp. *campestris*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), annual bur-weed (*Ambrosia acanthicarpa*), and the Mediterranean grass (*Schismus* sp.).

A reference site for Mojave spineflower was also visited on April 30, 2025 by Cecile Shohet. The location was on BLM lands about 15 miles north of Kramer Junction on US highway 395 and approximately 4 miles to the east. In 2024, Cecile Shohet observed hundreds of live Mojave spineflower plants at this site, in a low-lying silt-clay pan in an open area within a spinescale saltbush (*Atriplex spinifera*) plant community with scattered shrubs. There were no live Mojave spineflower individuals observed in 2025, likely due to the dryness of the year. In 2025, dried Mojave spineflower plant skeletons were documented at the site from the 2024 growing season and from years prior. This plant can be identified for several years after senescence as skeletons (dried remains) of this species remain relatively intact with sufficient morphologic characters to make an accurate identification.

On May 3, 2025 the botanists, Cecile Shohet and Denise LaBerteaux, visited a location in north Rosamond for recurved larkspur, (*Delphinium recurvatum*). It was located south of the intersection of Backus Road and State Route (SR) 14. The survey area included both the east and west sides of SR 14. The botanists surveyed suitable habitat throughout the area, a chenopod scrub vegetation community with alkaline clay soil. The site also supported a rich diversity of desert shrubs including cheesebush (*Ambrosia salsola*), white bursage (*Ambrosia dumosa*), Nevada ephedra (*Ephedra nevadensis*), Cooper's goldenbush (*Ericameria cooperi*), desert mallow (*Sphaeralcea ambigua*), hop sage (*Grayia spinosa*), little leaf horsebrush (*Tetradymia glabrata*), California buckwheat (*Eriogonum fasiculatum* var. *polifolium*) and desert tomato (*Lycium andersonii*).

Joshua trees (*Yucca brevifolia*) and creosote bush (*Larrea tridentata*) also occurred sporadically in this habitat. Two live *Delphinium* plants were observed, both were in a vegetative condition prior to flowering, one in an early bud stage, the other with leaves only. There are two *Delphinium* species that can occur in the area, one the common, *Delphinium parishii* ssp. *parishii,* and the other, the special status species, *Delphinium recurvatum.* Without a mature flower, it is not possible to determine which species of *Delphinium* was observed. Additionally, *Calochortus striatus* was unexpectedly observed in flower at this site, a special status rare plant (CRPR 1B) with potential to occur at the Euismod Project Area, making a reference visit to a known site for this species no longer necessary. Annual species located at this site included red-stemmed filaree (*Erodium cicutarium*), rattlesnake sandmat (*Euphorbia albomarginata*)*,* and the Mediterranean grass *(Schismus* spp.).

On May 3, 2025, the two botanists visited two known sites for Rosamond eriastrum, (*Eriastrum rosamondense*), both in Antelope Valley and south of Rosamond, one at the intersection of SR 138 (W. Avenue D) and 30th Street, and the other just north of the intersection of SR 138 (W. Avenue D) and 52th Street W. The habitat at the first site consisted of sandy hummocks adjacent to alkali clay pans. Allscale saltbush (*Atriplex polycarpa*) and shadscale (*Atriplex confertifolia*) were the dominant shrubs forming the shadscale scrub shrubland vegetation alliance. Scattered shrubs included, box-thorn (*Lycium cooperi*), budsage (*Artemisia spinescens*), and Nevada ephedra (*Ephedra nevadensis*). Annuals at the site included the non-natives, red brome (*Bromus rubens*), red-stemmed filaree (*Erodium cicutarium*)*,* Cheat grass *(*Bromus *tectorum*)*,* and Russian thistle *(Salsola tragus*) with the native annual, rattlesnake sandmat (*Euphorbia albomarginata*)*.* No Rosamond eriastrum nor its dried remains were observed, although the eriastrum was observed at this site in 2024 (personal communication, Denise LaBerteaux). The habitat of the second site, consisted of an open alkali flat or plains with scattered patchy chenopod scrub and annual grassland with some hummocks. As with the first site, no Rosamond eriastrum nor its dried remains were observed, although the eriastrum was observed at this site in 2024 (Calflora 2025). In addition, at the second site (SR 138 and 52th Street) one individual of *Calochortus striatus* was unexpectedly observed.

A reference site for Lancaster milk-vetch (*Astragalus preussii* var. *laxiflorus*) was also visited by Cecile Shohet and Denise LaBerteaux on May 3, 2025 on the east side of Lancaster, northwest of the intersection of E Ave G and 80th St E. No Lancaster milk-vetch was observed in 2025. The habitat consisted of allscale saltbush (*Atriplex polycarpa*) with shadscale (*Atriplex confertifolia*) and scattered Joshua trees (*Yucca brevifolia*) on a cracked clay alkali hard pan with low sandy hummocks of vegetation. The shrub Nevada ephedra (*Ephedra nevadensis*) was interspersed. Annuals included the non-natives, red brome (*Bromus rubens*), red-stemmed filaree (*Erodium cicutarium*)*,* Russian thistle *(Salsola tragus*)*,* Cheat grass *(Bromus tectorum*)*,* and the Mediterranean grass *(Schismus* sp.). Native annuals included common goldfields (*Lasthenia gracilis*) and desert fiddleneck *(Amsinckia tessellata* var*. tessellata*)*.*

On May 3, 2025 the two botanists visited a known site for Clokey's cryptantha (*Cryptantha clokeyi*) on the west side of Lancaster in Antelope Valley, northwest of the intersection of W Avenue L and 85th St W. No Clokey's cryptantha was observed. The habitat was relatively flat, a north sloping bajada of the Sierra Pelona Mountains, with an annual grassland vegetation community with coarse sandy soil.

On May 10, 2025 Cecile Shohet visited a reference site for *Astragalus hornii* var. *hornii* in west Rosamond. The only report is a 1931 collection at Willow Springs which is 8 miles to the east of

the Project Area. The area currently identified as Willow Springs is a developed home site and farm and was not surveyed. Another site in close proximity with potential habitat is Bean Springs, about a mile west of Willow Springs. The botanist walked in the vicinity of the old dry spring and adjacent areas with some scattered desert olive (*Forestiera pubescens*). No Astragalus was observed. Very few live annuals observed in the area. The habitat in the larger area consisted of allscale saltbush (*Atriplex polycarpa*) with scattered creosote bush (*Larrea tridentata*), and dried annual non-native grasses. Desert prince's plume (*Stanleya pinnata* var. *pinnata*) was growing in several locations along the dirt roads in the area. There was low to moderate disturbance in the area, several dirt roads and scattered piles of trash dumps.

Most records for the CRPR 4 plants have not been processed by CNDDB or are at nonspecific locations (CNDDB 2025a).

3.2 FLORA

Plants identified in the Study Area totaled 64 taxa in 19 plant families. Cecile Shohet and Denise LaBerteaux recorded 57 native species and 7 non-native weedy species. Appendix A contains a complete list of all plant species encountered at the Euismod Project Area during the 2025 rare plant survey.

A single vegetation community occurs throughout the Project Area, a creosote bush (*Larrea tridentata*) scrub alliance with sporadic western Joshua trees present. The western Joshua trees are distributed at a low cover of <1%. The creosote bush is mature and irregularly spaced, with open gaps. The gaps are sometimes occupied by a variety of shrubs, the common ones include: goldenhead (*Acamptopappus sphaerocephalus* var. *hirtellus*), burro bush (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), rubber rabbitbrush (*Ericameria nauseosa*), wire-lettuce (*Stephanomeria pauciflora*), spiny hope-sage (*Grayia spinosa*), desert tomato (*Lycium andersonii*), box-thorn (*Lycium cooperi*), and Nevada ephedra (*Ephedra nevadensis*). Occasionally, the gaps were dominated by closely spaced cheesebush (*Ambrosia salsola*). Less frequently encountered shrubs include: Acton encelia (*Encelia actoni*), Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*), sticky snakeweed (*Gutierrezia microcephala*), silver cholla (*Cylindropuntia echinocarpa*), winter fat (*Krascheninnikovia lanata*), Mojave Desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium*), yucca wild buckwheat (*Eriogonum plumatella*).

The annual and perennial herb layer is open and sparsely populated with patchy bare soil present. This is likely due to the lack of precipitation prior to the survey season. Common native species include: common goldfields (*Lasthenia gracilis*), vinegar-weed (*Lessingia glandulifera* var. *glandulifera*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), showy prickly cryptantha (*Cryptantha muricata* var. *muricata*), mixed-nut pectocarya (*Pectocarya heterocarpa*), narrow-toothed pectocarya (*Pectocarya linearis* ssp. *ferocula*), Arizona popcornflower (*Plagiobothrys arizonicus*), rattlesnake weed (*Euphorbia albomarginata*), white mallow (*Eremalche exilis*), desert calico (*Loeseliastrum matthewsii*), Schott gilia (*Loeseliastrum schottii*), brittle spineflower (*Chorizanthe brevicornu* var. *brevicornu*), rose-and-white wild buckwheat (*Eriogonum gracillimum*), and two-toothed wild buckwheat (*Eriogonum viridescens*). Annual bur-sage (*Ambrosia acanthicarpa*) was predominately found in close proximity to the dirt roads.

Non-native, weedy annual herbs and grasses were common in the Project Area, especially in previously disturbed areas (powerlines) and adjacent to dirt roads. Non-native Mediterranean grasses (*Schismus arabicus* or *Schismus barbatus*), red brome (*Bromus rubens*), and cheatgrass

(*Bromus tectorum*) were ubiquitous. The non-native annual herb in the Geranium family, red-stemmed filaree (*Erodium cicutarium*), was also abundant throughout the Project Area. Russian-thistle (*Salsola tragus*), a non-native annual tumbleweed in the Goosefoot family, was common. The weedy mustard, tumble mustard (*Sisymbrium altissimum*), was prominent along the primary east-west dirt road in the Project Area, which merges with Rosamond Boulevard. This mustard was common and abundant for approximately 250 feet from this road north into the Project Area, on the east side. Tumble mustard became less frequent further in the interior of the Project Area and towards the west side. Ripgut brome (*Bromus diandrus*) is another annual weedy grass that was found in the Project Area. It was not found throughout the project area as the other weedy non-natives described above. It was localized to one area, the west gen-tie corridor, and was located in the ditch line and along a drainage. It also extended outside the boundaries of the Project Area for a short distance and in low numbers. It is possible that this invasive was imported to the Project Area in the rocks used to line the drainage surrounding the substation. It was the only non-native, invasive species mapped because it is quite limited in its distribution and therefore has potential to be treated and eradicated. It is important to note that each of the non-native species discussed are naturalized throughout much of California and are not considered high priority invasive species. Ripgut brome is limited in the Project Area and therefore can be treated and potentially reduced in scope or eradicated, if treatment is long term and consistent with weed management science.

3.3 RARE PLANTS

Western Joshua tree (*Yucca brevifolia*) was the only special status species located in the Project Area. There were no other rare plant species encountered in the Project Area during the survey. Quality suitable habitat was not found in the Project Area for six of the seven potentially occurring CRPR 1B plants (rare and endangered in California and elsewhere); hence, these species are unlikely to occur. Clokey's cryptantha was the only CRPR 1B plant found to have potential to occur based on potential suitable habitat in the Project Area.

- **Horn's milk-vetch** – the habitat for Horn's milk-vetch includes both wetland and non-wetland habitat, alkaline playas or sinks, as well as wet habitats: meadows, lakeshores, seeps and springs. These habitat types are not found in the Project Area. The Bean Springs and Willow Springs reference sites are close by, approximately seven to eight miles from the Project Area, yet the springs appear to have dried since the 1931 Horn's milk-vetch sighting and documented vouchered specimen, and this species has not been re-observed. Without appropriate habitat, Horn's milk-vetch is not likely to occur in the Project Area.
- **Lancaster milk-vetch** – there were no Lancaster milk-vetch individuals found at the reference site visited by Cecile Shohet and Denise LaBerteaux on May 3, 2025 on the east side of Lancaster. On May 10, 2025 there was a subsequent visit to this site for photo documentation. The habitat consisted of allscale saltbush (*Atriplex polycarpa*) and shadscale (*Atriplex confertifolia*) with scattered Joshua trees (*Yucca brevifolia*) on a cracked clay alkali hard pan with low sandy hummocks of vegetation. The above described habitat, alkali flats, and shadscale scrub habitat does not occur in the Project Area. Therefore, Lancaster milk-vetch is not likely to occur in the Project Area.
- **Desert cymopterus** – there were no microsites located within the Project Area with loose or stabilized sandy soil, therefore, there was no habitat to support desert cymopterus. Therefore, desert cymopterus is not likely to occur in the Project Area.

- **Alkali mariposa-lily** – while visiting reference sites for recurved larkspur and Rosamond eriastrum, in north Rosamond and south of Rosamond, respectively, the alkali mariposa-lily was inadvertently found at both sites on May 3, 2025, making an additional trip to a known reference site unnecessary. The habitat of the first site consisted of a chenopod scrub vegetation community with alkaline clay soil. The site also supported a rich diversity of desert shrubs and was occasionally mesic, when inundated with sufficient rainfall and drainage flows. One alkali mariposa-lily individual, in flower, was observed. The habitat of the second site consisted of an open alkali flat or plains with scattered patchy chenopod scrub and annual grassland with occasional hummocks. One alkali mariposa-lily individual, about to flower, was observed. The Project Area does not have the habitat to support alkali mariposa-lily since chenopod scrub and alkali soil was not found. It could also be expected that alkali mariposa-lily would germinate if it occurred in the Project Area as it was found twice at reference sites. Therefore, alkali mariposa-lily is not likely to occur in the Project Area.
- **Clokey's cryptantha** – on May 3, 2025, the two botanists visited a reference site for Clokey's cryptantha south of Lancaster. The site habitat was relatively flat, a north sloping bajada and consisted of annual grassland with coarse sandy soil. Clokey's cryptantha was not observed at this site in 2025. The Project Area has potential habitat for Clokey's cryptantha as the vegetation community, a creosote bush (*Larrea tridentata*) scrub alliance supports annual grassland species (grasses and both annual and perennial forbs) and the soils at the site range from a sandy loam to a loamy sand. Three Cryptantha species (one currently in the genus *Greeneocharis*, but previously categorized as *Cryptantha*) were observed in the Project Area during the 2025 rare plant survey. One in particular, *Cryptantha muricata* var. *muricata*, the showy prickly cryptantha, was common in the northeast portion of the Project Area and is closely related to Clokey's cryptantha. The Jepson eFlora, describes a synonym for Clokey's cryptantha (*Cryptantha clokeyi*), as *Cryptantha muricata* var. *clokeyi*, making them varieties of each other. It is likely that since the showy prickly cryptantha was common in portions of the Project Area and germinated in abundance in the 2025 season, although it was a dry year, that Clokey's cryptantha would also germinate. Since Clokey's cryptantha was not found at the reference site in 2025, it is also possible that 2025 was not a good germination year for Clokey's cryptantha. However, since 2024 was a year with good moisture in the west Mojave Desert, and the botanists conducting the rare plant survey in 2024 did not observe Clokey's cryptantha, this species is not likely to occur in the Project Area. Regardless of moisture conditions, this species was not observed.
- **Recurved larkspur** – the habitat for recurved larkspur includes both wetland and non-wetland habitat, in alkaline soils in grassland or chenopod scrub. On May 3, 2025 the botanists, Cecile Shohet and Denise LaBerteaux, visited a known location in north Rosamond for recurved larkspur. The habitat was a chenopod scrub vegetation community with alkaline clay soil that is occasionally inundated (mesic) with rainfall and drainage patterns. The site also supported a rich diversity of desert shrubs. Joshua trees (*Yucca brevifolia*) and creosote bush (*Larrea tridentata*) also occurred sporadically in this habitat. Two live larkspur individuals were observed, both were in a vegetative condition prior to flowering, one in an early bud stage, the other with leaves only. There are two *Delphinium* species that can occur in the area, one common, and the other, the special status species,

recurved larkspur. To accurately identify the larkspur to species, a mature flower is needed. The Project Area does not support the habitat necessary for recurved larkspur as alkaline soils in grassland or chenopod scrub does not occur. It could also be expected that larkspur would germinate if it occurred in the Project Area as a larkspur species was found at the reference site. Therefore, recurved larkspur is not likely to occur in the Project Area.

- **Rosamond eriastrum** – is found in sandy or alkaline soils, in hard packed sandy cryptogrammic soil among low hummocks with dry pools, adjacent to alkali clay pans, in alkali plains, and in openings in alkali chenopod scrub, and edges of vernal pools. These habitat types were not observed in the Project Area. Therefore, this species is not likely to occur in the Project Area.

The following CRPR 4 species with some potential of occurring in the Project Area were identified in Table 1-1 and in the 1.3 Summary of Database Search, and are discussed below with regard to their likelihood to occur in the Project Area (Mojave spineflower is included in the discussion, although habitat does not exist in the Project Area, because it was referenced in the 2024 Euismod Rare Plant Survey Report as having potential to have been missed because it may have been too dry to identify during the 2024 survey period):

- **Kern County evening-primrose** is found in sandy or gravelly soils**.** The early May survey was in the correct timeframe to observe this species in flower, although 2025 was a dry year with the expectation of low germination rates. Kern County evening-primrose was not observed, but three other plant species in the evening primrose family were observed, two in the genus *Camissonia* (the same genus as Kern County evening-primrose) and one in the genus, *Camissoniopsis* (this genus was previously *Camissonia*). Soils in the Project Area consist of a loamy sand or sandy loam, rather than sand or gravel, but potential for this species exists in the Project Area. As a number of other species closely related to Kern County evening-primrose were observed in the Project Area this season, and botanists conducting the 2024 rare plant survey did not observe the Kern County evening-primrose, this species is not likely to occur in the Project Area.
- **Peirson's morning glory** can be found on rocky slopes in grassland making the Project Area not optimal for this species, but with some potential to occur. Photographs that document this species in CalPhotos were examined and show close-ups of Pierson's morning glory in what appears to be a loamy soil with small sporadic gravel. This habitat is similar to what occurs in the Project Area. However, this species was not observed during the 2025 or 2024 rare plant surveys, in a dry and wetter year respectively. Morning glory species would be difficult for a botanist to miss, as they are vine-like and climb over vegetation and the ground in a showy irregular pattern, with pointy characteristic leaves and large white, funnel shaped flowers. This species is not likely to occur in the Project Area.
- **White pygmy-poppy** is found in sandy or gravelly places that are undisturbed often in western Joshua tree woodland or creosote scrub. This plant is quite small in size, from one to three centimeters. It has a white flower that would catch a botanist's attention. If in a dried up or vegetative condition, it would be difficult to observe. The early May survey was in the correct timeframe to observe this species in flower, although 2025 was a dry year with the expectation of low germination rates. White pygmy-poppy was not observed. Soils in the Project Area consist of a loamy sand or sandy loam, rather than sand or gravel,

but potential for this species exists in the Project Area. 2024 was a year with good moisture in the west Mojave Desert, the botanists conducting the rare plant survey in 2024 did not observe white pygmy-poppy. Therefore, this species is not likely to occur in the Project Area.

- **Mojave paintbrush** can be found in Joshua tree woodland and is known from the valley floor in Lancaster, making the Project Area potential habitat for this species, although not optimal. It is a perennial and large in size (30-60 cm), with a yellow flower, all of which would catch a botanist's attention, making it unlikely to be missed in a survey. The early May survey was in the correct timeframe to observe this species in flower, and the botanists conducting both the 2025 and 2024 rare plant surveys, in a dry and wetter year respectively, did not observe this species. As a result, this species is not likely to occur in the Project Area.
- **Mojave spineflower** is generally found in alkaline soil, in sand or gravel, and silt-clay hard pan edges in chenopod or creosote scrub. Cecile Shohet visited a reference site on April 30, 2025 in the vicinity of Kramer Junction (Hwy 395 & Hwy 58), an open silt-clay pan within a spinescale saltbush scrub vegetation community. No Mojave spineflower was observed, likely due to the dryness of the year. However, in 2024, Cecile Shohet observed hundreds of live Mojave spineflower plants at this same site. In 2025, the dried Mojave spineflower plant skeletons from the 2024 growing season and from years prior were documented at the site. Alkaline silt-clay pan habitat was not observed in the Project Area. Moreover, even though the 2025 season lacked sufficient moisture for reference site individuals to germinate and mature, Mojave spineflower dried plant material remains intact and is uniquely identifiable for several years after the plant senesces. Mojave spineflower dried skeletons were not observed. Therefore, Mojave spineflower did not occur in the Project Area as the dried skeletons would have been observed.
- **Crowned muilla** can be found in creosote bush scrub and Joshua tree woodland and is known from the valley floor in the vicinity of Lancaster. It is a perennial in the Brodiaea family growing from a corm, which is an underground food storage organ and flowers in March and April. By early May this species would be in fruit and less visible than when in flower, but still recognizable and observable. It was not seen by the botanists in the Project Area in fruit during the early May 2025 surveys nor was it observed in rare plant surveys conducted in 2024 in a good rain year. Therefore, crowned muilla is not likely to occur in the Project Area.
- **San Joaquin blue curls** flowers from July to October and is not generally known from the Mojave Desert geographic province, where the Project Area is located. There is a known San Joaquin blue curls site in close proximity to the Project Area along a road, likely the result of a "hitchhiker" seed that germinated. The timing of the 2024 and 2025 rare plant survey did not correspond to the flowering period of San Joaquin blue curls and if the plant had been in a vegetative condition, it could have been missed, although its leaves and smell (vinegar weed is another common name) are rather distinctive. It was not observed in 2024 or 2025. However, the likelihood of this species within the Project footprint is slim. Therefore, this species is unlikely to occur in the Project Area.

3.4 INVASIVE PLANTS

Only one species of invasive plant was observed in the Project Area, ripgut brome (*Bromus diandrus*), an invasive, non-native weed. Approximately 800-1200 plants were observed along the west gen-tie corridor in the rocked ditch line surrounding the SCE Whirlwind Substation and in an adjacent drainage. A few, less than about 50 individuals, occurred outside the 50 ft boundary zone on each side of the west gen-tie (Figure 1-4). The California Invasive Plant Council (CAL-IPC 2025), rates ripgut brome as "MODERATE", the median level of rating it gives for an invasive plant. Ripgut brome is an annual plant in the grass family (Poaceae). It is one of a number of European grasses that have displaced much of the native grasses and native annual and perennial herbaceous plants throughout California. As mentioned previously, it was mapped and documented because it was found in only one area in the Project Area and therefore has the potential to be treated successfully and possibly eradicated, especially since it does not appear common outside the boundaries of the Project.

An invasive plant is defined by the CAL-IPC (2025) as "plants that are not native to an environment, and once introduced, they establish, quickly reproduce and spread, and cause harm to the environment, economy, or human health. Also, they 1) are not native to, yet can spread into, wildland ecosystems; and 2) displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes".

Ripgut brome is naturalized throughout much of California and generally is not considered a high priority invasive species for treatment, hence the "moderate" rating by CA-IPC. It is possible this species was brought into the project as seeds "carried" on the rocks imported to line the drainage surrounding the substation.

3.5 CDNPA PLANTS

There were two CDNPA species recorded in the Project Area during the survey. These included western Joshua tree (*Yucca brevifolia*) and silver cholla (*Cylindropuntia echinocarpa*). Western Joshua tree is also a special status species and a State of California Candidate for Listing. A complete census and assessment of western Joshua tree was conducted in the 2024 and documented in the report, "Western Joshua Tree *(Yucca brevifolia)* Census, Euismod BESS Project Site" (Turner and Young, 2024). Therefore, western Joshua tree will not be discussed in detail in this report.

There were two individuals of silver cholla located in the Project Area and are mapped in Figure 1-5. One silver cholla was located in the western portion of the Project Area, and one was located in the eastern side, in between the Project Area boundary and the 50-foot boundary zone.

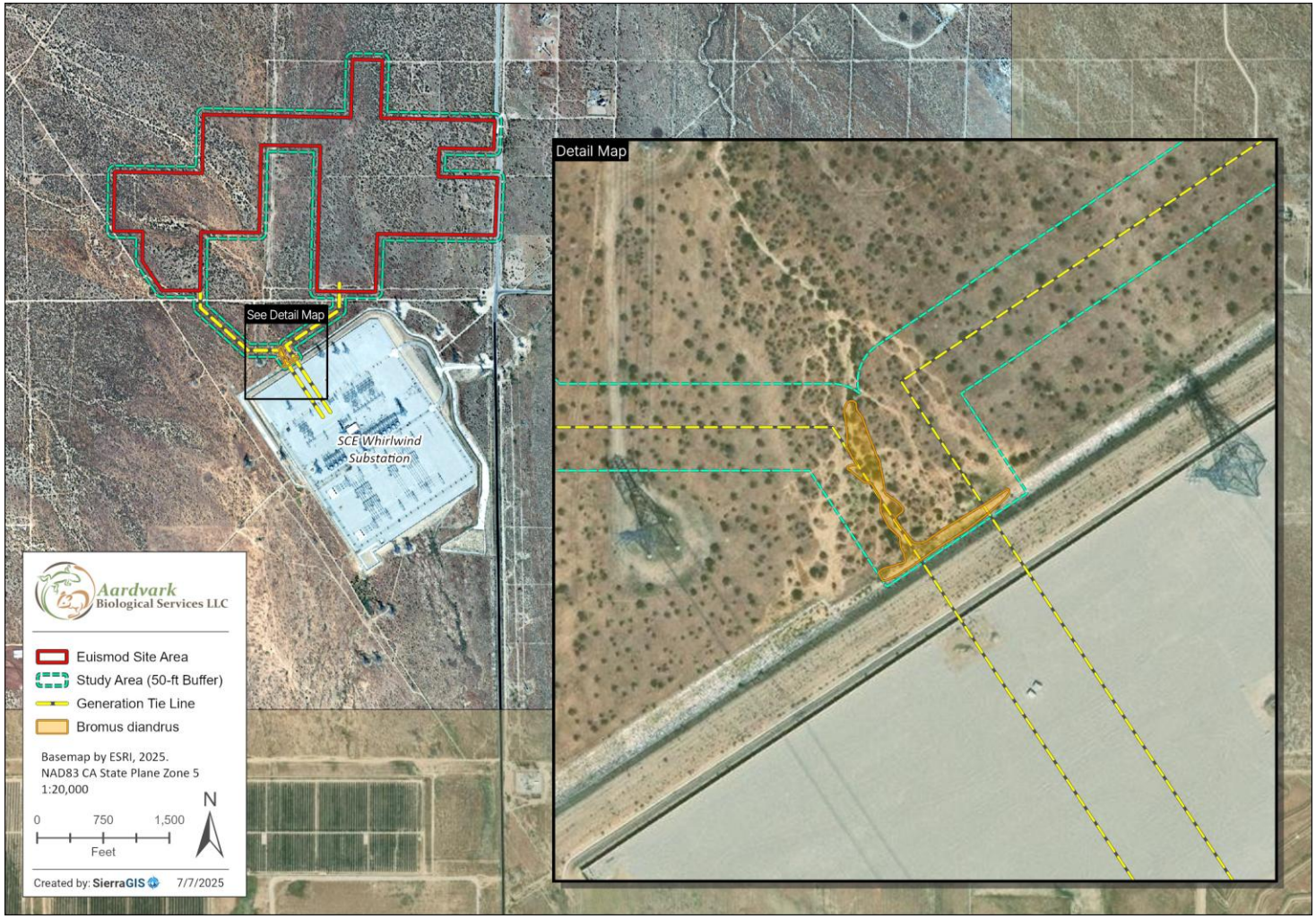


Figure 1-4. Invasive Plant Locations, Euismod Project Area

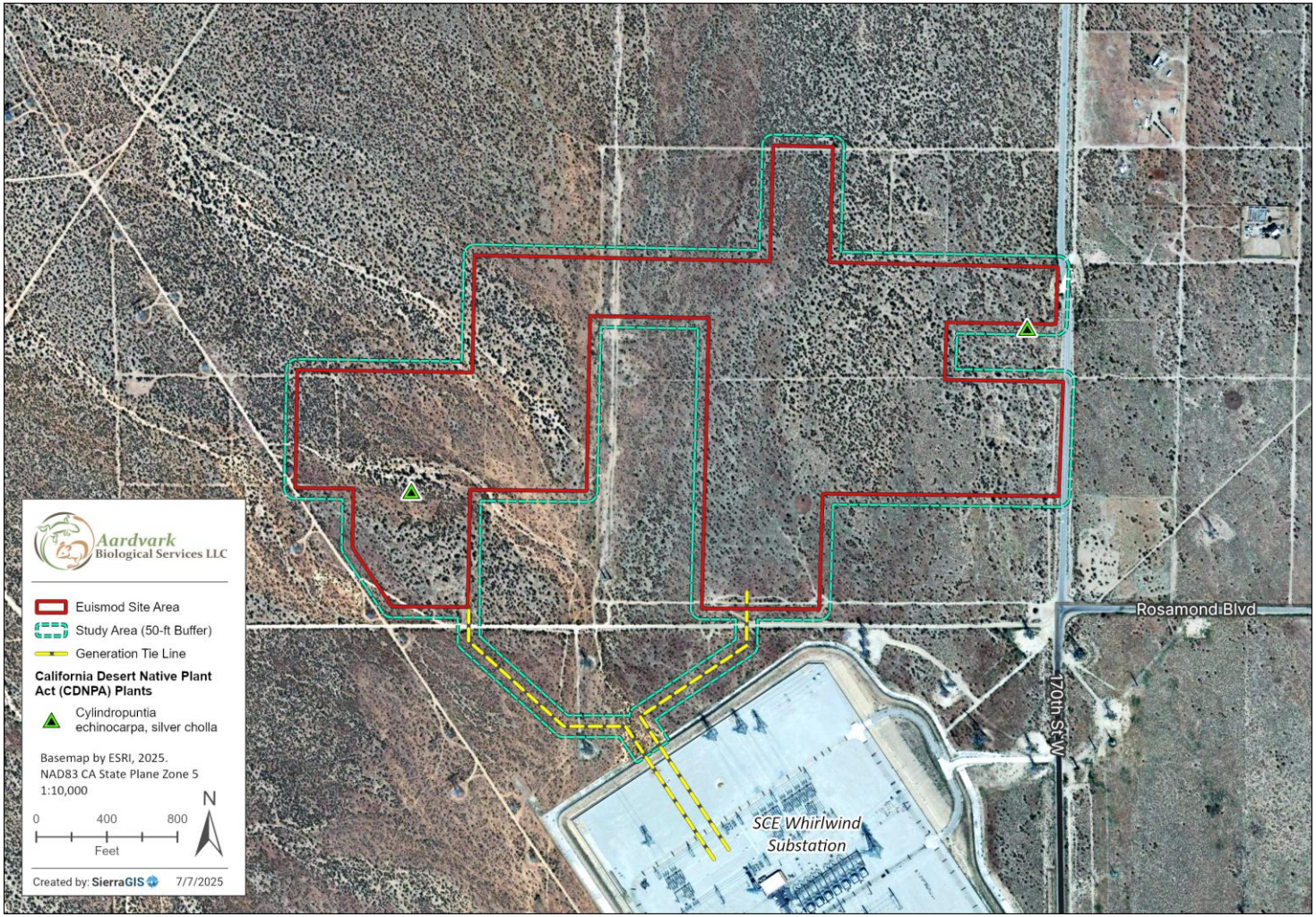


Figure 1-5. CDNPA Locations, Euismod Project Area

4. DISCUSSION AND SUMMARY

Western Joshua tree (*Yucca brevifolia*) is a special status species, a Candidate for Listing under the California Endangered Species Act, and was observed throughout the Project site, both in the 2025 and the 2024 rare plant surveys. A complete census and assessment of this species was conducted in the 2024 report, "Western Joshua Tree *(Yucca brevifolia)* Census, Euismod BESS Project Site" (Turner and Young, 2024). For this reason, western Joshua tree will not be discussed in detail in this report.

During the course of this protocol-level rare plant survey, there were no other special status rare plant species found in the proposed 120-acre Euismod Project Area nor in the approximately 7-acre gen-tie corridor. Suitable habitat was not observed in the Project Area for the following CRPR 1B plants known to occur in the west Mojave Desert and in the vicinity of the Project Area: Horn's milk-vetch, Lancaster milk-vetch, alkali mariposa-lily, desert cymopterus, recurved larkspur, and Rosamond eriastrum.

Clokey's cryptantha, a CRPR 1B.2 plant species, was found to have potential habitat in the Project Area, but likely does not occur, based on several findings. First, three other species of *Cryptantha* were observed during the course of the survey. One is closely related, a variety of Clokey's cryptantha, and was relatively common in parts of the Project Area. If several species of *Cryptantha* germinated and reached maturity in 2025, one of which is closely related and relatively abundant in areas, there is likelihood that Clokey's cryptantha would germinate and reach maturity. Second, rare plant surveys were conducted in 2025, a dry year, and in 2024, a wetter year, with the result of no observations of Clokey's cryptantha. The blooming period for Clokey's cryptantha is in April, when most plants in this species flowers, but it is the fruit which is used identify *Cryptantha* species. Without a mature fruit, a taxonomic identification is not reliable or certain. For this reason, May or June is the correct window to identify and observe this plant species.

There were six CRPR 4 species with potential to occur in the Project Area due to similarity in habitat: Pierson's morning glory, Kern County evening primrose, white pygmy-poppy, Mojave paintbrush, crowned muilla, and San Joaquin blue curls. San Joaquin blue curls is known from a different geographic region but is documented in the area, likely a "hitchhiker" seed that germinated and matured in roadside habitat. The other five species are known from the Mojave Desert and have sufficient habitat similarities with the Project Area to have potential to occur. Each of these species have either a flower, fruit or vegetation characteristic that would catch a botanist's attention, making it unlikely to be missed in a survey. The early May survey was in the correct timeframe to observe these species in flower, and the botanists conducting both the 2025 and 2024 rare plant surveys, in a dry and wetter year respectively, did not observe this species. As a result, these species are not likely to occur in the Project Area. Mojave spineflower is not included as one of the six CNPS Rank 4 species above, as it does not have potential to occur as there is no habitat for this species in the Project Area.

Only one species of invasive plant was observed in the Study Area. Approximately 800-1200 Ripgut brome (*Bromus diandrus*) plants, an invasive, non-native weed, were observed in the west gen-tie corridor in the rocked ditch line surrounding the SCE Whirlwind substation and in an adjacent drainage. In addition, few, less than about 50 individuals, occurred outside the 50 ft boundary zone on each side of the west gen-tie.

There were two CDNPA plant species present in the Project Area. These included western Joshua tree (*Yucca brevifolia*) and silver cholla (*Cylindropuntia echinocarpa*). Western Joshua tree is also

a State of California Candidate for Listing. A complete census and assessment of the western Joshua tree was conducted in 2024 (Turner and Young, 2024). Therefore, western Joshua tree will not be discussed and summarized in detail in this report. There were two individuals of silver cholla located in the Project Area, one was located in the western portion of the Project Area, and one was located on the eastern side, in between the Project Area boundary and the 50-foot boundary zone.

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Appendix A. Plant List for the Euismod Project Area, Willow Springs, Kern County, California, May 2025

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
GYMNOSPERMS		
EPHEDRACEAE	**EPHEDRA FAMILY**	
Ephedra nevadensis	Nevada ephedra	shrub
EUDICOT FLOWERING PLANTS		
ASTERACEAE	**SUNFLOWER FAMILY**	
Acamptopappus sphaerocephalus var. *hirtellus*	goldenhead	shrub
Ambrosia acanthicarpa	annual bur-sage	annual herb
Ambrosia dumosa	burro bush	shrub
Ambrosia salsola	cheesebush	shrub
Encelia actoni	Acton encelia	shrub
Ericameria cooperi var. *cooperi*	Cooper's goldenbush	shrub
Ericameria nauseosa	rubber rabbitbrush	shrub
Gutierrezia microcephala	sticky snakeweed	shrub
Lasthenia gracilis	common goldfields	annual herb
Lessingia glandulifera var. glandulifera	vinegar-weed	annual herb
Lessingia sp.	vinegar-weed	annual herb
Logfia depressa	dwarf cottonrose	annual herb
Malacothrix glabrata	desert dandelion	annual herb
Stephanomeria exigua ssp. *exigua*	small wirelettuce	annual herb
Stephanomeria pauciflora	wire-lettuce	perennial herb/subshrub
BORAGINACEAE	**BORAGE FAMILY**	
Amsinckia intermedia	common fiddleneck	annual herb
Amsinckia tessellata var. *tessellata*	desert fiddleneck	annual herb
Cryptantha micrantha var. *micrantha*	red-root cryptantha	annual herb
Cryptantha muricata var. *muricata*	showy prickly cryptantha	annual herb
Greeneocharis circumscissa var. *circumscissa*	cushion greeneocharis	annual herb
Pectocarya heterocarpa	mixed-nut pectocarya	annual herb
Pectocarya linearis ssp. *ferocula*	narrow-toothed pectocarya	annual herb
Plagiobothrys arizonicus	Arizona popcornflower	annual herb
BRASSICACEAE	**MUSTARD FAMILY**	
Brassica sp.[3]	mustard	annual herb
Sisymbrium altissimum[3]	tumble mustard	annual herb
CACTACEAE	**CACTUS FAMILY**	
Cylindropuntia echinocarpa[2]	silver cholla	perennial stem succulent
CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
Grayia spinosa	spiny hope-sage	shrub
Krascheninnikovia lanata	winter fat	shrub
Salsola tragus[3]	Russian-thistle	annual herb
EUPHORBIACEAE	**SPURGE FAMILY**	
Croton setigerus	turkey-mullein	annual herb
Euphorbia albomarginata	Rattlesnake weed	perennial herb
FABACEAE	**LEGUME FAMILY**	

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
Astragalus didymocarpus	two-seeded milkvetch	annual herb
Astragalus layneae	Layne milkvetch	perennial herb
Astragalus lentiginosus var. *variabilis*	freckled milkvetch	annual, perennial herb
GERANIACEAE	**GERANIUM FAMILY**	
Erodium cicutarium[3]	red-stemmed filaree	annual herb
LAMIACEAE	**MINT FAMILY**	
Salvia carduacea	thistle sage	annual herb
Salvia columbariae	chia sage	annual herb
MALVACEAE	**MALLOW FAMILY**	
Eremalche exilis	white mallow	annual herb
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**	
Mirabilis laevis[5]	wishbone bush	subshrub
ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
Camissonia campestris ssp. *campestris*	Mojave sun cup	annual herb
Camissonia kernensis ssp. *gilmanii*	Gilman's evening-primrose	annual herb
Camissoniopsis pallida ssp. *pallida*	pale sun cup	annual herb
POLEMONIACEAE	**PHLOX FAMILY**	
Loeseliastrum matthewsii	desert calico	annual herb
Loeseliastrum schottii	Schott gilia	annual herb
POLYGONACEAE	**BUCKWHEAT FAMILY**	
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb
Chorizanthe watsonii	Watson's spineflower	annual herb
Eriogonum brachyanthum	short-flower wild buckwheat	annual herb
Eriogonum fasciculatum var. *fasciculatum*[4]	California buckwheat	shrub
Eriogonum fasciculatum var. *polifolium*	Mojave Desert California buckwheat	shrub
Eriogonum gracillimum	rose-and-white wild buckwheat	annual herb
Eriogonum plumatella	yucca wild buckwheat	shrub
Eriogonum viridescens	two-toothed wild buckwheat	annual herb
SOLANACEAE	**NIGHTSHADE FAMILY**	
Lycium andersonii	desert tomato	shrub
Lycium cooperi	box-thorn	shrub
ZYGOPHYLLACEAE	**CALTROP FAMILY**	
Larrea tridentata	creosote bush	shrub
MONOCOT FLOWERING PLANTS		
ASPARAGACEAE	**ASPARAGUS FAMILY**	
Yucca brevifolia[1,2]	western Joshua tree	perennial leaf succulent
POACEAE	**GRASS FAMILY**	
Bromus diandrus[3]	ripgut grass	annual grass
Bromus rubens[3]	red brome, foxtail chess	annual grass
Bromus tectorum[3]	cheatgrass	annual grass
Hordeum murinum[3]	wall barley	annual grass

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
Schismus spp. [3]	Mediterranean grass	annual grass
Stipa hymenoides	sand rice grass	perennial grass
Stipa speciosa	desert needlegrass	perennial grass

[1] special status species
[2] State Candidate for Listing as Threatened and CDNPA species
[3] non-native weed
[4] planted, roadside
[5] variety could not be determined

Appendix B. Photographs from Reference Site Visits



Photograph 1. April 30, 2025, Habitat for desert cymopterus



Photograph 2. April 7, 2024, desert cymopterus in flower at the same site in 2024



Photograph 3. April 30, 2025, Habitat for Mojave spineflower



Photograph 4: April 30, 2025, Mojave spineflower dried specimen from previous year



Photograph 5: May 3, 2025, Larkspur species in a vegetative state



Photograph 6: May 3, 2025, Alkali mariposa-lily in flower



Photograph 7: May 3, 2025, Habitat for Rosamond eriastrum and alkali mariposa-lily



Photograph 8: May 10, 2025, Habitat for Lancaster milk-vetch



Photograph 9: May 3, 2025, Habitat for Clokey's cryptantha

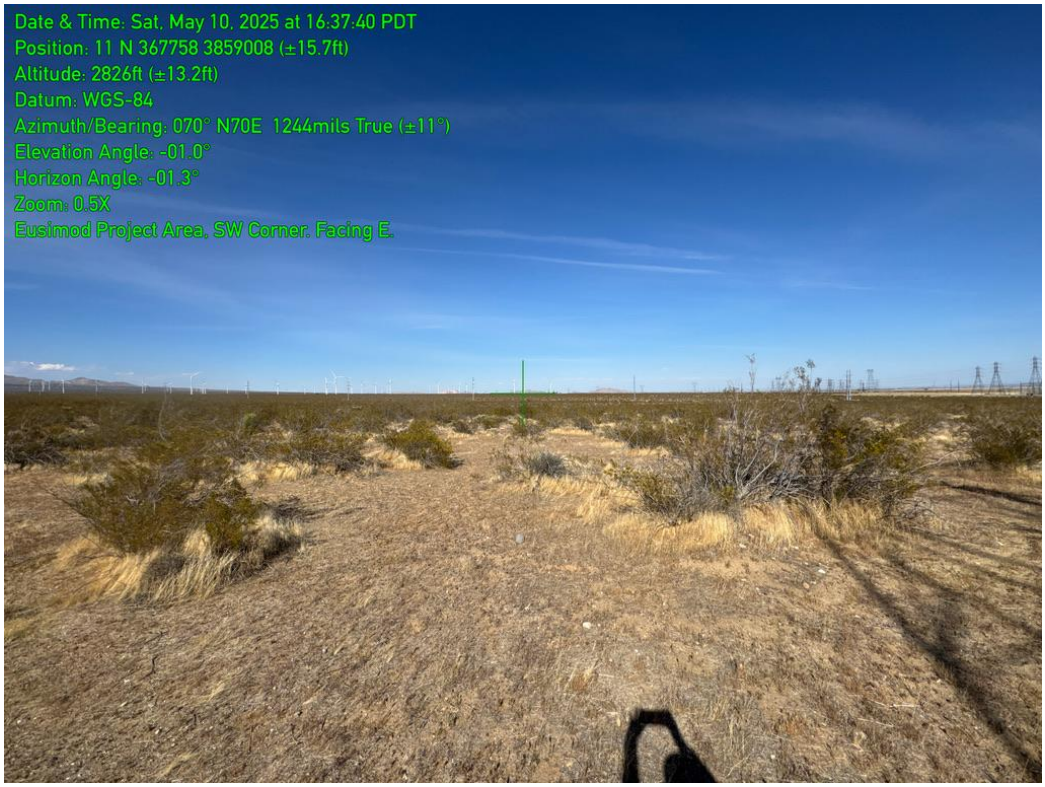
Appendix C. Photographs of the Euismod Project Area, Willow Springs, Kern County, California, May 10, 2025



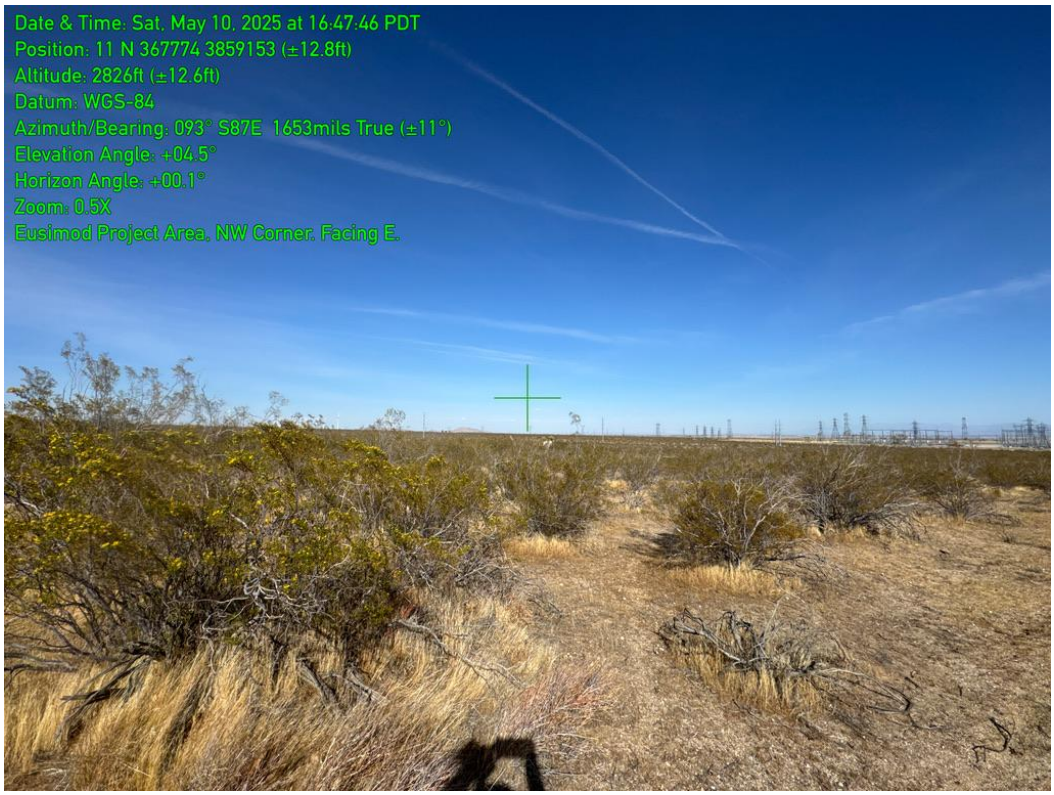
Photograph 1: East Polygon of Project Area, SE corner, facing North



Photograph 2: West Polygon of Project Area, SE corner, facing North



Photograph 3: West Polygon of Project Area, SW corner, facing East



Photograph 4: West Polygon of Project Area, NW corner, facing East



Photograph 5: West Polygon of Project Area, East Side, Middle, facing North



Photograph 6: East Polygon of Project Area, E side, Middle, facing West



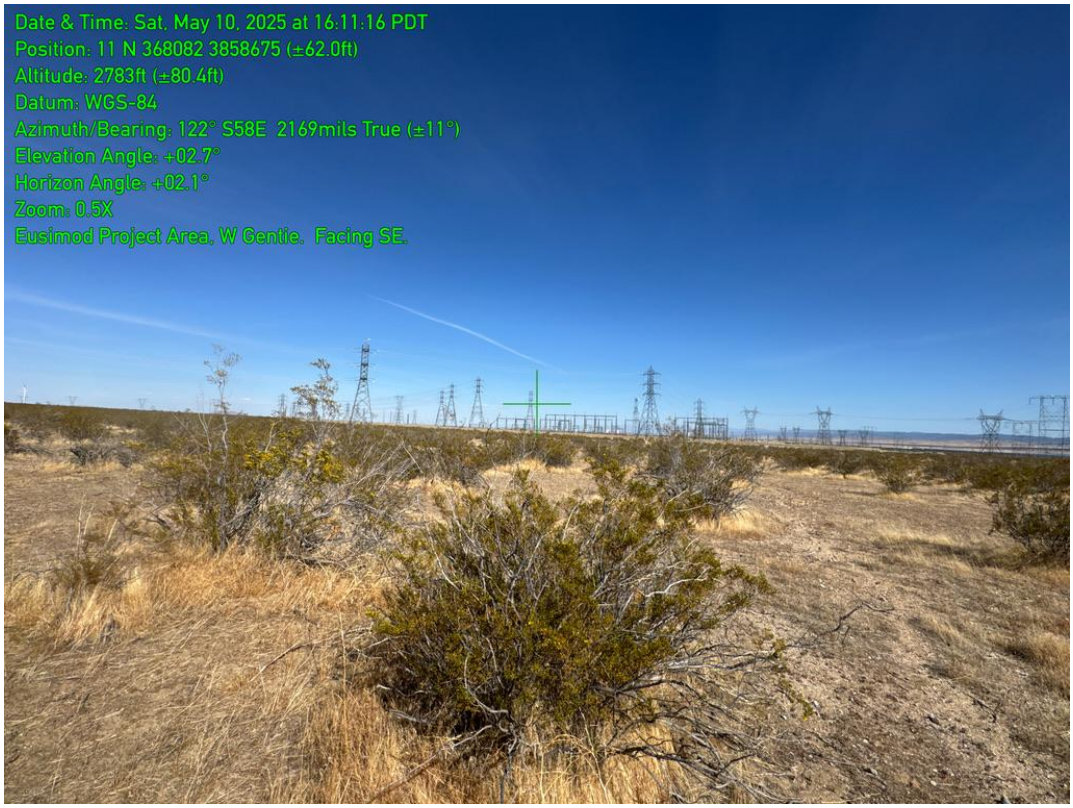
Photograph 7: East Polygon of Project Area, NE corner, facing West



Photograph 8: Northmost Polygon, North side, facing South



Photograph 9: East Gen-tie, facing South



Photograph 10: West Gen-tie, facing Southeast

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Appendix C3
Habitat Assessment Report

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Rincon Consultants, Inc.
250 East 1st Street, Suite 1400
Los Angeles, California 90012
213-788-4842

January 28, 2025
Project No: 23-14888

Joe Stenger, P.G.
Program Director, Renewables Delivery Team
TRC Solutions
2666 Rodman Drive
Los Osos, California 93402
Via email: jstenger@trccompanies.com

Subject: Habitat Assessment and Burrow Survey Report for Western Burrowing Owl, Desert Kit Fox, and American Badger, Euismod BESS Project, Kern County, California

Dear Mr. Stenger:

Rincon Consultants, Inc. (Rincon) completed this report to document biological surveys at the Euismod Battery Energy Storage System (BESS) Project (project). The project involves development of a BESS site and associated access roads in unincorporated Kern County, California. This report was prepared to document the results of the habitat assessment and burrow surveys for three species that have potential to occur on site: western burrowing owl (BUOW; *Athene cunicularia*), desert kit fox (DKF; *Vulpes macrotis*), and American badger (AMBA; *Taxidea taxus*). The BUOW is a candidate species for listed under the California Endangered Species Act (CESA), the AMBA is designated as species of special concern in California, and the DKF is protected as fur bearing mammal under the California Fish and Game Code (CFGC).

Project Location and Description

The project is generally located in the southern portion of unincorporated Kern County on the eastern side of the Tehachapi Mountains (Attachment 1; Figure 1). The Project Land Holdings include approximately 120 acres of undeveloped land located approximately 16 miles west of the unincorporated community of Rosamond and 20 miles northwest of the city of Lancaster.

The project proposes to develop a BESS site and associated access roads on the Project Land Holdings in eastern Kern County, California (Attachment 1; Figure 2). The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Southern California Edison Whirlwind 220 kilovolt (kV) substation located approximately 0.3 mile to the southeast. Batteries associated with the project would be contained on site in outdoor enclosures. An access road would connect the site to the nearest public road at 170th Street.

Methods

This section describes methods for literature review/desktop evaluation, assessment of habitat, and burrow surveys for BUOW, DKF, and AMBA in the Project Land Holdings and a 500-foot buffer (Survey Area). Data collected in the field were interpreted into maps depicting vegetation communities and locations of potentially suitable burrows for the above species.

Background and Literature Review

Prior to visiting the Survey Area, recent aerial photography of the site (Google Earth 2024) was reviewed to establish familiarity with the Survey Area and surrounding natural landscape. The California Natural Diversity Database (CNDDB; California Department of Fish and Wildlife [CDFW] 2024) was searched for records of BUOW, DKF, and AMBA within three miles of the Survey Area. Additionally, Rincon reviewed life history information to understand habitat requirements for the target species and to allow for a preliminary assessment of habitat suitability.

Field Survey

Two surveys were conducted on April 9 to 11, 2024, and May 30, 2024 to capture the entire Survey Area. Rincon biologists Jose Lopez and Stephanie Tam performed the first field assessment on April 9, 10, and 11, 2024. Rincon biologists Jose Lopez and Ben Chubak conducted the second field assessment on May 30, 2024. Biologists conducted habitat assessments in conjunction with burrow surveys for BUOW, DKF, and AMBA. On April 9, weather conditions included clear skies, temperatures ranging from 59 degrees Fahrenheit (°F) in the morning to 78 °F in the afternoon, and wind speeds up to 9 miles per hour (mph). Conditions on April 10 were also clear, with a temperature of 66 to 81°F, and wind speeds up to 5 mph. The survey day on April 11 had similar conditions with clear skies, 57 to 81°F in temperature, and wind speeds up to 6 mph. Conditions during the May 30 survey were clear with a temperature range of 58 to 87°F and wind speeds of up to 9 mph.

The habitat assessment consisted of walking the Survey Area to confirm vegetation, habitat types, and documentation of burrows with a specific focus on their potential to support the target species. The habitat assessment and burrow survey methodology was also conducted in accordance with the guidelines established by the *CDFW Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game, now CDFW 2012). The BUOW habitat assessment and burrow survey included pedestrian transects that were spaced to allow 100 percent visual coverage of the ground surface in areas where the habitat assessment determined suitable habitat was present. The distance between transect center lines was 10 meters (approximately 30 feet) and was reduced where necessary to account for differences in terrain, vegetation density, and ground surface visibility. The survey was limited to the Project Land Holdings and a 500-foot buffer, where accessible. Buffer areas on adjacent private properties were surveyed using belt transects in locations where permission was granted by the property owners. For areas where access permission was not obtained, surveys were conducted using binoculars. Biologists documented potential BUOW, DKF and AMBA burrows and species sign using ArcGIS Field Maps, took representative site photographs (Attachment 2), and noted general site characteristics, predominant vegetation communities, and observations of flora and fauna (Attachment 3). Site conditions were also recorded on each survey day.

Species Background

This section provides information on life history, range, habitat requirements, and legal/protection status for BUOW, DKF, and AMBA.

Western Burrowing Owl

The BUOW is a small (less than 12 inches tall), long-legged owl with a short tail and a wingspan of approximately 20 to 24 inches. Males and females are similar in size and appearance and display little sexual dimorphism. Juvenile owls are similar in appearance to adults, but they lack most of the white spotting above and brown barring below. Unlike most owls, BUOWs are often active during the day, although they tend to avoid the midday heat. However, like many other kinds of owls, BUOWs do most of their hunting from dusk until dawn. BUOWs perch during daylight at the entrance to their

burrow or on low posts. Nesting occurs from March through August. BUOWs form a pair-bond for more than one year and exhibit high site fidelity, reusing the same burrow year after year (Haug et al. 1993). The female remains inside the burrow during most of the egg laying and incubation period and is fed by the male throughout brooding. BUOWs are opportunistic feeders, consuming a diet that includes arthropods, small mammals, and birds, and occasionally amphibians and reptiles.

BUOWs use a variety of natural and modified habitats for nesting and foraging that are typically characterized by low growing vegetation. BUOW habitat includes, but is not limited to, native and non-native grassland, interstitial grassland within shrub lands, and shrub lands with low density shrub cover. BUOWs typically use burrows made by fossorial mammals, such as squirrels, badgers, coyotes, fox, and even turtles or tortoises. These are burrows usually found in dry, level, open terrain such as prairie, plains, desert, and grassland, shrub lands with low height vegetation, golf-courses, drainage ditches, earthen berms, unpaved airfields, pastureland, dairies, fallow fields, and agricultural use areas. Favored locations are those in relatively sandy sites (presumably for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance and slightly elevated locations to avoid flooding; and areas with available perches such as fences, utility poles, posts, or even raised rodent mounds located nearby.

BUOWs are primarily restricted to the western United States and Mexico and were once abundant and widely distributed within coastal southern California. Populations have declined in counties such as Los Angeles, Orange, San Diego, Riverside, and San Bernardino. Urbanization has greatly reduced the amount of suitable habitat for this species; other contributions to their decline include poisoning from pest control, collisions with automobiles, and shooting.

The BUOW is federally protected by the Migratory Bird Treaty Act (MBTA) in the United States and is designated by the United States Fish and Wildlife Service (USFWS) as a Bird of Conservation Concern in five Bird Conservation Regions (USFWS 2021). On October 25, 2024, the California Fish and Game Commission designated BUOW as a candidate species for listing pursuant to the CESA (Center for Biological Diversity et al. 2024). As a result, the species receives the same level of protection afforded to species listed as threatened or endangered under CESA.

Desert Kit Fox

The DKF is the smallest canid species in North America. The coat colors of DKF vary by range and season; the species' summer coats are tan and winter coats are grey. DKF are primarily nocturnal but may be observed during the day when basking outside of the den entrance or taking short excursions. In September and October, the female focuses on preparing the pupping den. It excavates its own dens, enlarges the burrows of other species, or dens in man-made features (e.g., culverts). This species may use several dens in a season and change dens often. Mating can occur from December to March, and the pups will be born after a 48-to-52-day gestation period. The male will provide most of the female's food while the female is lactating. At around four to five months old, pups will disperse. The primary prey item for DKF is Merriam's kangaroo rat (*Dipodomys merriami*). Other prey items include black-tailed jackrabbits (*Lepus californicus*) and desert cottontails (*Sylvilagus audubonii*). In addition to nocturnal rodents, DKF hunt birds, reptiles, and insects.

DKF live in the open desert and are generally found in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub. Seventy-five percent of sightings are in areas with less than 20 percent vegetation cover. Kit foxes are almost exclusively carnivorous and seldom need to drink, getting all their water in the food they eat and by having a digestive tract that is highly efficient at absorbing water.

DKF inhabit the Mojave and Colorado Deserts of California; they are an uncommon to rare, permanent resident of arid regions of the southern half of the state (Grinnell et al. 1937).

DKF are protected as fur bearing mammals under the CFGC Chapter 5, Section 460 and may not be taken at any time.

American Badger

AMBAs are mid-sized (10 to 11 pounds), burrowing mammals in the weasel family. AMBAs use underground burrows for resting, denning, and prey caching. They are well-suited for burrowing and digging and have large, powerful shoulders, stout front legs and feet, large front claws, and short ears. They have distinctly colored faces that sport black patches over a white throat, chin, and cheeks. AMBAs are a solitary species with large home ranges that may overlap with other individuals of either sex. In the spring, female badgers give birth to litters ranging from one to five kits. The young badgers stay in their grass-lined den, nursing until 3 months of age. Juveniles may emerge from the den as early as 2 months but stay with their mother until 5 to 6 months old (Washington Department of Fish and Wildlife [WDFW] 2024).

AMBAs are widely distributed throughout the state of California but may be less common in areas where they historically occurred. AMBAs may occur in grassland, shrubsteppe, desert, dry forest, parkland, and agricultural areas but are most typically found in drier open stages of most shrub, forest, and herbaceous habitats with friable soils present (CDFW 2024). They require soils that allow the excavation of den sites and support burrowing prey species (such as ground squirrels).

The AMBA is a CDFW-designated Species of Special Concern (CDFW 2024).

Existing Setting

This section provides information on existing site conditions, including land use, topography, soils, and vegetation communities and land cover types.

Land Use

The Survey Area is located in the western Mojave Desert in the shadow of the Tehachapi Mountains to the northwest. There is an existing wind farm to the northeast. South of the Survey Area, patches of native desert community intermingle with solar panels, agriculture, residential areas, and disturbed (ruderal) land (TRC Solutions 2023). The Survey Area and surrounding vicinity are mostly undeveloped, with dominant land cover consisting of creosote bush (*Larrea tridentata*) scrub. Signs of historical grazing activity are evident from old cow manure observed throughout the Survey Area, indicating previous land use. Various well-traveled routes intersect the vegetation communities in and around the Survey Area including unpaved roads supporting local utility facilities, off-highway vehicle (OHV) trails, and hiking trails.

Topography and Soils

The Survey Area is located on alluvial slopes on the south side of the Tehachapi Mountain range at elevations of approximately 2,750 to 2,830 feet above mean sea level. The ground surface slopes gently to moderately in a northwest to southeast direction.

In general, soils found on site consist of sandy loams. The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey identifies three soil map units within the Survey Area: Cajon loamy sand, 2 to 9 percent slopes, Hesperia fine sandy loam, 2 to 5 percent slopes, and Rosamond fine sandy loam (USDA NRCS 2024).

Vegetation and Land Covers

The Survey Area is primarily comprised of creosote bush scrub with areas of cheesebush (*Ambrosia salsola*) and sweetbush (*Bebbia juncea*) (Attachment 1; Figure 3). Creosote bush cover is dense throughout the Survey Area, except for the southwestern portion and some areas in the center. Western Joshua trees (*Yucca brevifolia*) are located sporadically throughout the Survey Area with no other trees present. Ground cover is characterized by dense mats of California goldfields (*Lasthenia californica)* and non-native species such as redstem stork's bill (*Erodium cicutarium*), Mediterranean grass (*Schismus barbatus*), red brome (*Bromus rubens*), and cheatgrass (*Bromus tectorum*). Additionally, a thick understory is prevalent beneath most shrubs, consisting primarily of the aforementioned ground cover species, alongside Sisymbrium (*Sisymbrium* sp.) and native plants like phacelias (*Phacelia* sp.). Although several washes intersect the Survey Area, they do not have an obvious effect on species composition and dominance.

Results

This section discusses results of the literature/desktop review, and the habitat assessment and burrow survey for BUOW, DKF, and AMBA.

Habitat Assessment

The Survey Area generally contains suitable habitat for BUOW, DKF, and AMBA. The Survey Area is mostly undeveloped with dominant land cover consisting of creosote bush scrub interspersed with patches of cheesebush, sweetbush, and Joshua trees. Friable soils and existing burrows were observed throughout the Survey Area. Additionally, small mammals such as the black-tailed jackrabbit were observed during the survey indicating a potential prey base for the target species. Four CNDDB records of BUOW are within three miles of the Survey Area, with the most recent occurrence from 2011, indicating that BUOWs have occurred historically in the vicinity. No CNDDB occurrences for AMBA were documented within three miles of the Survey Area. DKF records are not tracked by the CNDDB; however, several DKF were observed at a nearby solar project site in 2018 and 2019 approximately five miles from the Survey Area (Kern County 2020).

Burrow Survey

No individual BUOW, DKF, or AMBA were observed during the survey. Several inactive burrows were observed within the Survey Area; burrow details are discussed below, and burrow locations are provided in Attachment 1, Figure 4.

Five burrows were observed, mapped, and classified based on size, shape, and signs of use (Attachment 1, Figure 4). Of the five burrows observed, one displayed whitewash indicative of past BUOW use, one displayed characteristic size and shape of desert tortoise (*Gopherus agasizzii*), and three were determined to belong to small mammals. No other active or inactive burrows were observed within the Survey Area aside from small rodent burrows, which, based on size, would preclude occupation by the larger BUOW, DKF, and AMBA. Dense ground vegetation cover may have concealed some inactive burrows and signs of target species; however, areas devoid of vegetation, such as the mouth and apron of most active burrows, are generally more conspicuous under these conditions, making it unlikely that active burrows were overlooked.

As mentioned above, one burrow observed near the center of the Survey Area exhibited signs of whitewash which would suggest potential past use by BUOW (Attachment 2, Photograph 12). However, no signs such as pellets, bones, feathers, or other animal scat were observed in the immediate vicinity. The burrow was old, collapsed, and featured two entrances, though there may have been four or five

entrances originally; structural degradation likely led to the merging of multiple entrances into one. The burrow was determined to not currently be occupied by BUOW or other species.

The potential desert tortoise burrow, located in the southwestern portion of the Survey Area, was partially collapsed and displayed the characteristic half-moon shape and flat bottom typical of desert tortoise (Attachment 2, Photograph 10). No desert tortoise or other animal scat or signs were observed within or around the burrow, and the burrow was not active at the time of the survey. Detailed information about the desert tortoise focused survey can be found in the Desert Tortoise Survey Report prepared for the Euismod BESS Project (Rincon 2025.

Three other inactive burrows were observed within the Survey Area, one of which had rabbit scat around the mouth of the burrow. These burrows were old, collapsed, and showed no evidence of BUOW use, such as pellets or whitewash, nor signs of DKF or AMBA activity, such as scat or claw marks.

Conclusion and Recommendations

The Survey Area is not currently occupied by BUOW, DKF, or AMBA. However, these species are highly mobile, and the Survey Area contains suitable habitat for them. In addition, BUOW and DKF individuals were recently documented nearby. As a result, future occupation of the Survey Area by these species is possible. Pre-construction surveys are recommended prior to construction. If BUOW is documented in the Survey Area is still considered a CESA candidate species or has been listed as threatened or endangered under CESA at the time project construction commences, consultation with CDFW regarding potential project impacts to BUOW and application for an Incidental Take Permit (ITP) under CESA may be required.

Thank you for the opportunity to support the Euismod BESS Project. Please do not hesitate to contact Lisa Zumwalde (lzumwalde@rinconconsultants.com) at (562) 822-9776 for questions about the contents of this report.

Sincerely,
Rincon Consultants, Inc.



Lisa Zumwalde
Senior Biologist/ Project Manager



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Supervising Biologist



David Daitch, PhD
Vice President, Natural Resources

Attachments

Attachment 1 Figures
Attachment 2 Representative Site Photographs
Attachment 3 Floral and Faunal Compendium

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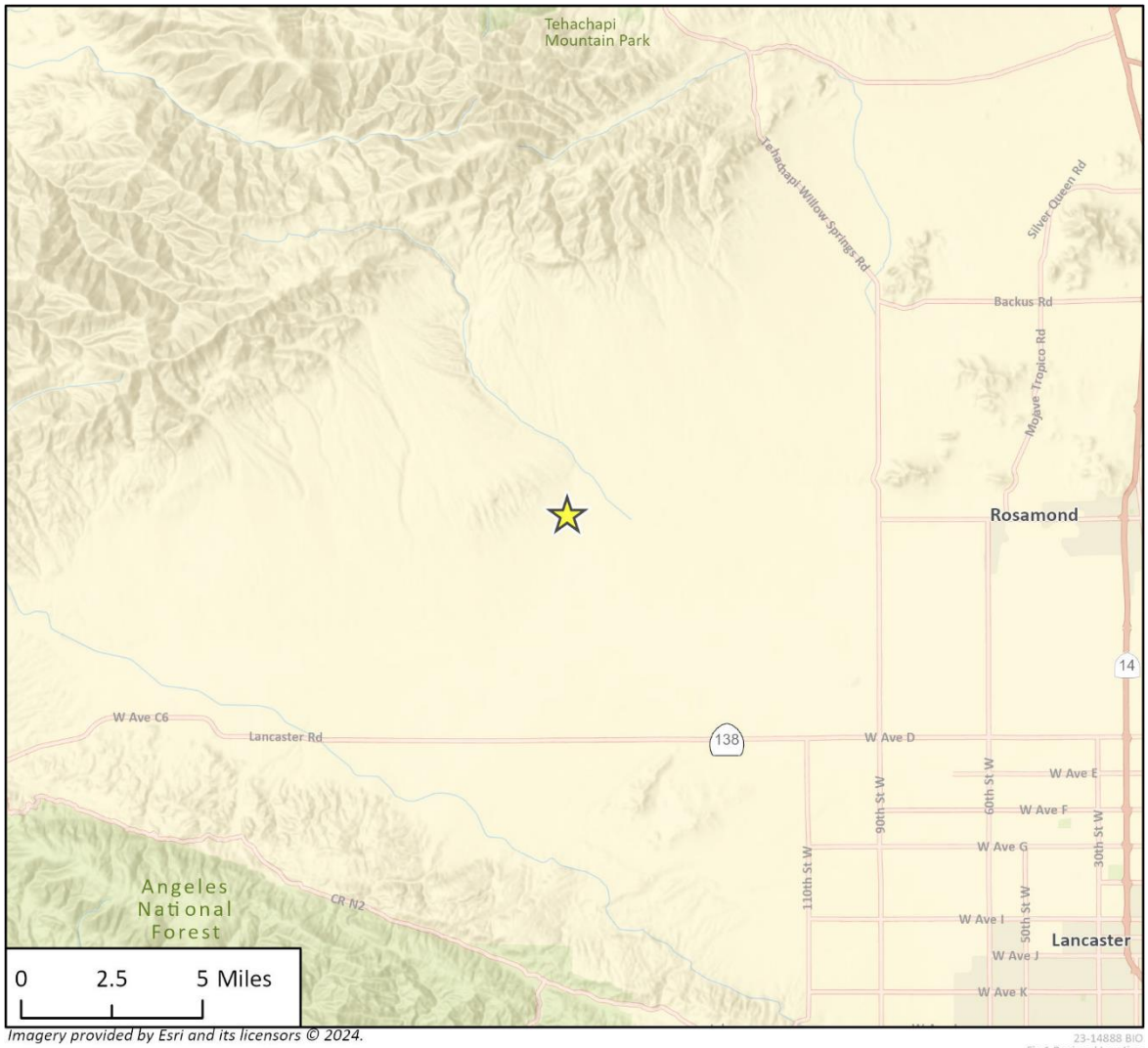
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Attachment 1

Figures

Figure 1 Regional Vicinity



Project Location

N

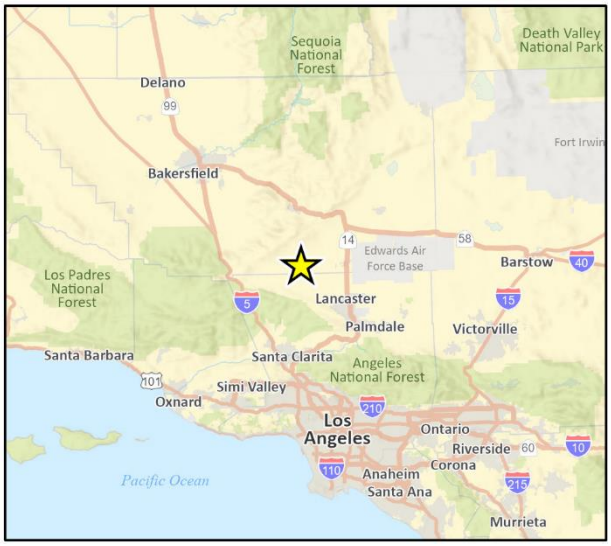
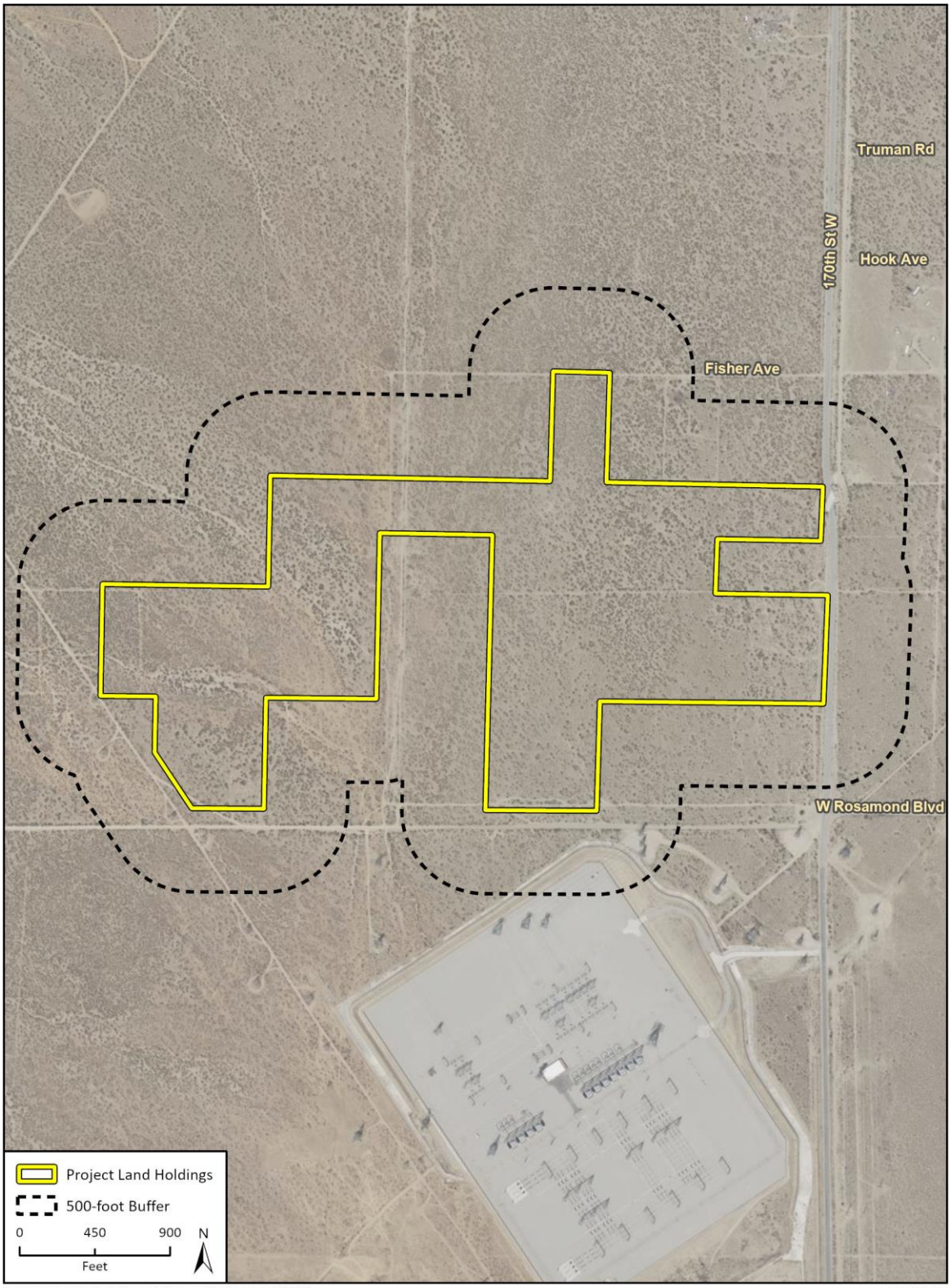


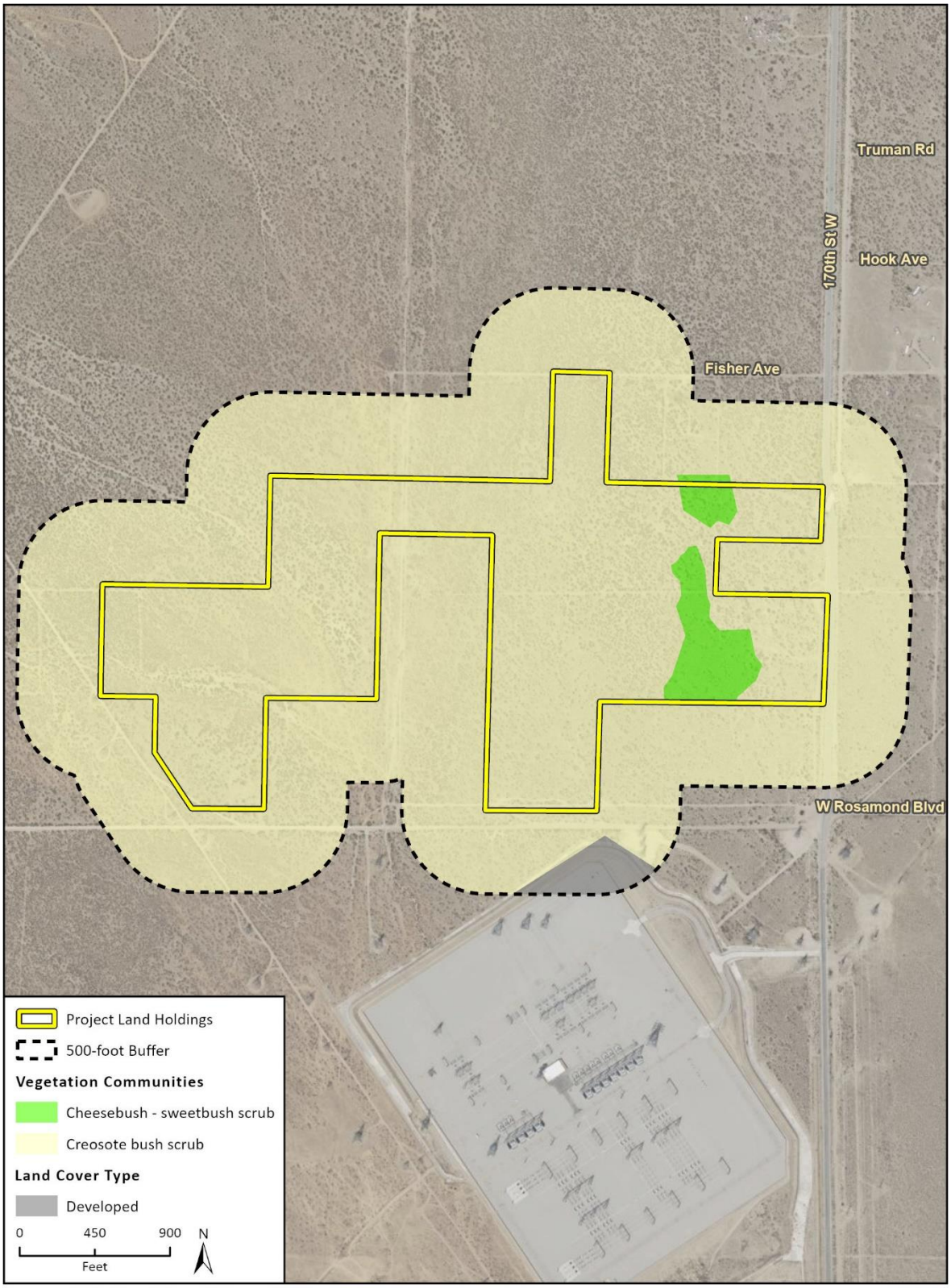
Figure 2 Project Land Holdings and Survey Area



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23-14888 BIO
Fig 2 Survey Area

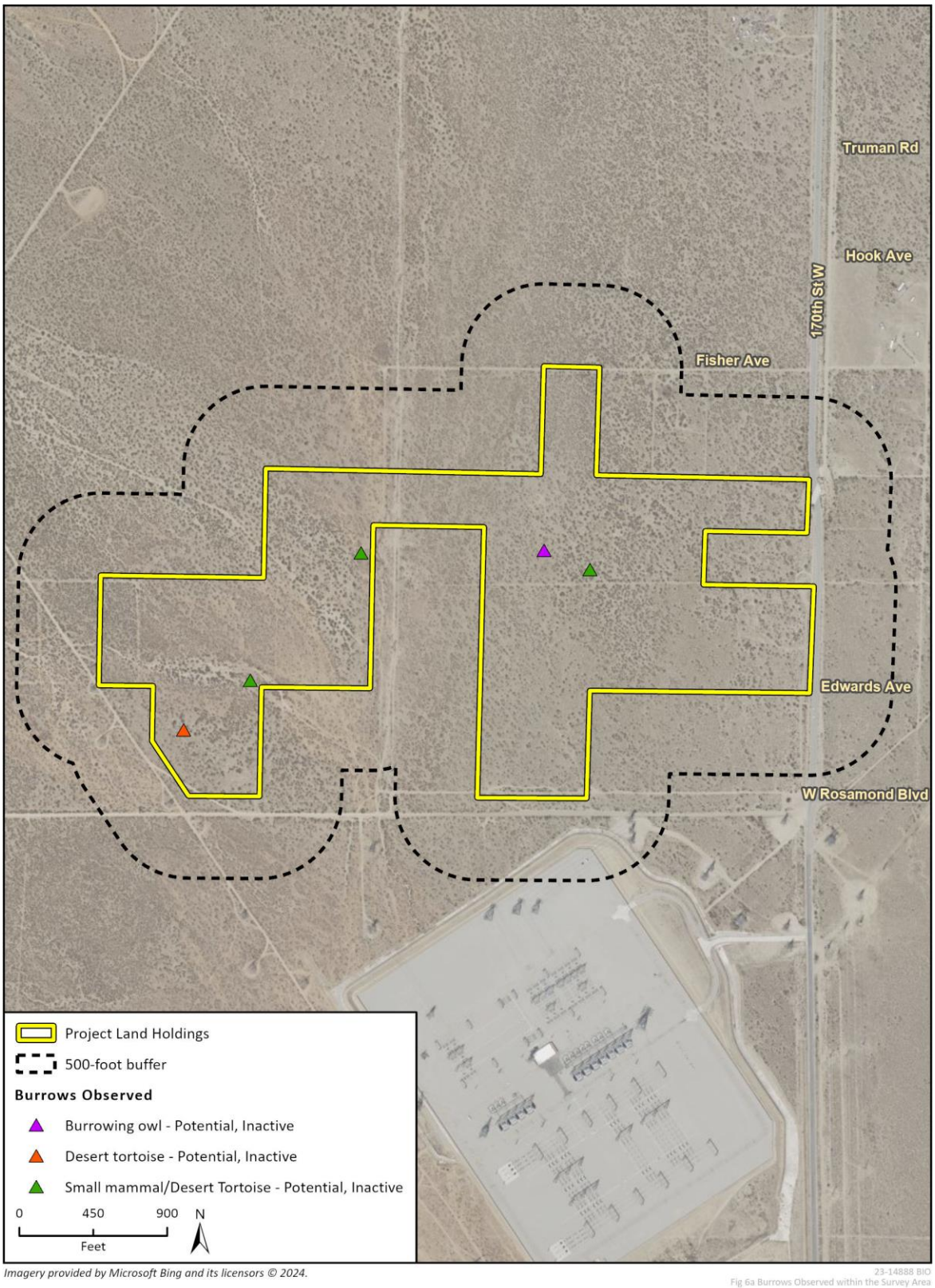
Figure 3 Vegetation Communities and Land Cover Types



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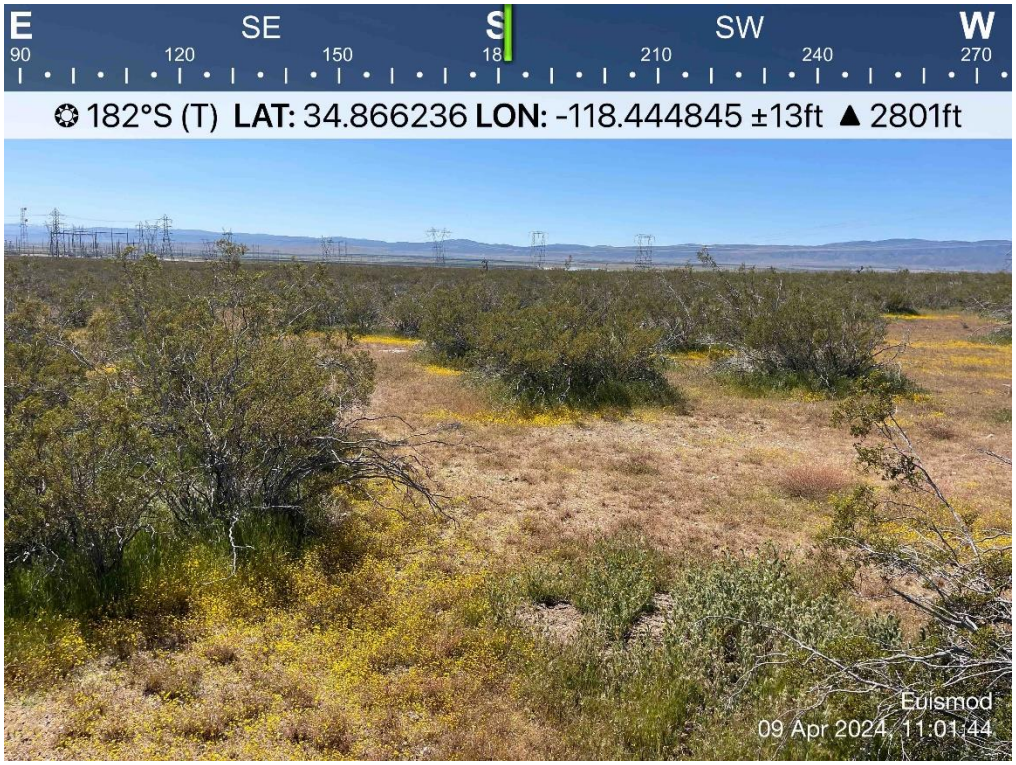
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Fig 7 Veg Communities_500ft Survey Area

Figure 4 Burrow Observations



Attachment 2

Representative Site Photographs



Photograph 1. View of the Project Land Holdings from the western corner, facing south.



Photograph 2. View of the Project Land Holdings from the southwest corner, facing north.



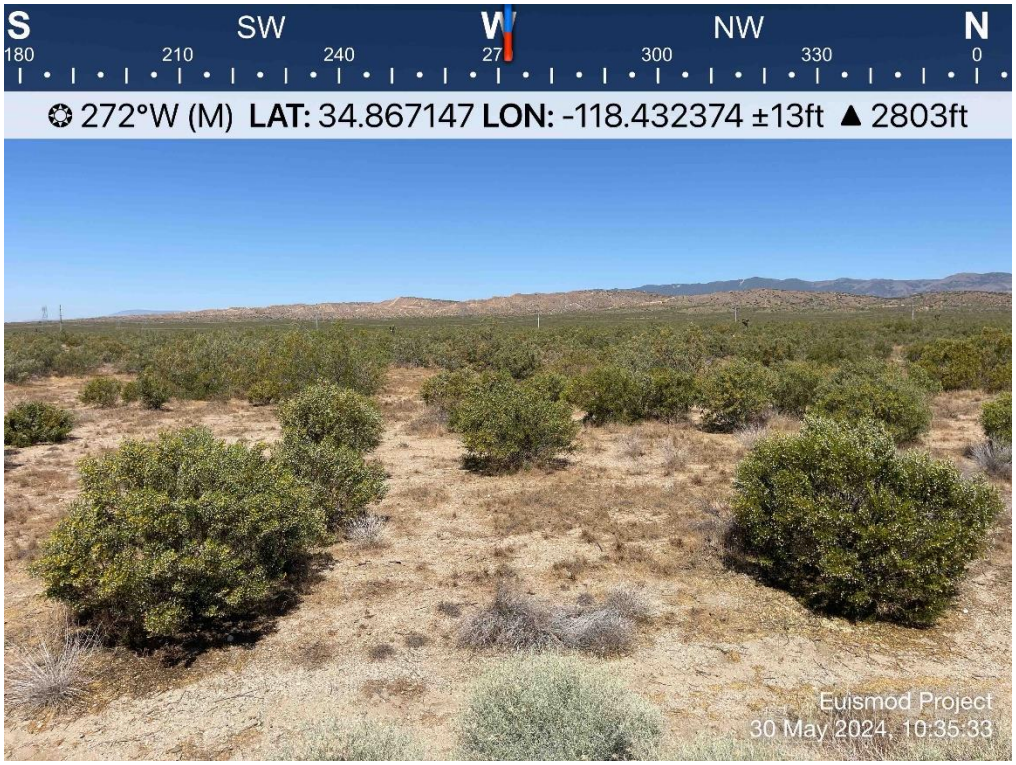
Photograph 3. View of the Project Land Holdings from the northwest corner, facing south.



Photograph 4. View of the Project Land Holdings from the northcentral corner, facing south.



Photograph 5. View of the Project Land Holdings from the southcentral corner, facing north.



Photograph 6. View of the Project Land Holdings from the eastern corner, facing west.



Photograph 7. View of the off-road trail, northern corner of the Project Land Holdings, facing south.



Photograph 8. View of the cheesebush scrub, eastern section of Project Land Holdings, facing north.



Photograph 9. View of western Joshua trees, eastern section of Project Land Holdings, facing northeast.



Photograph 10. Potential desert tortoise burrow (inactive), facing southwest.



Photograph 11. Potential small mammal burrow (inactive), rabbit scat visible. facing northwest.



Photograph 12. Potential BUOW burrow (inactive), whitewash visible, facing south.

Attachment 3

Floral and Faunal Compendium

Plant Species Observed within the Survey Area

Scientific Name	Common Name	Native or Introduced
Acamptopappus sphaerocephalus	rayless goldenhead	Native
Ambrosia dumosa	white bursage	Native
Ambrosia salsola	cheesebush	Native
Amsinckia sp.	fiddleneck	Native
Amsinckia tessellata	devil's lettuce	Native
Astragalus lentiginosus	freckled milk vetch	Native
Bromus rubens	red brome	Introduced
Bromus tectorum	cheatgrass	Introduced
Camissoniopsis sp.	suncup	Native
Castilleja exserta	purple owl's clover	Native
Croton setiger	dove weed	Native
Cryptantha sp.	popcorn flower	Native
Cylindropuntia echinocarpa	silver cholla	Native
Ephedra sp.	ephedra	Native
Eriastrum sp.	woollystars	Native
Ericameria nauseosa	rubber rabbitbrush	Native
Eriogonum gracillimum	rose and white buckwheat	Native
Erodium cicutarium	redstem stork's bill	Introduced
Euphorbia albomarginata	rattlesnake weed	Native
Eschscholzia californica	California poppy	Native
Grayia spinosa	spiny hop sage	Native
Hordeum murinum	wall barley	Introduced
Krascheninnikovia lanata	winterfat	Native
Larrea tridentata	creosote	Native
Lasthenia californica	California goldfields	Native
Linanthus parryae	sand blossom	Native
Loeseliastrum matthewsii	desert calico	Native
Lycium cooperi	peach thorn	Native
Malacothrix glabrata	desert dandelion	Native
Mirabilis laevis	desert wishbone bush	Native
Phacelia tanacetifolia	lacy phacelia	Native
Salvia columbariae	chia	Native
Schismus spp.	Mediterranean grass	Introduced
Sisymbrium sp.	hedge mustards	Introduced
Stephanomeria exigua	small wirelettuce	Native
Stipa hymenoides	Indian rice grass	Native
Stipa speciosa	desert needle grass	Native
Yucca brevifolia	Joshua tree	Native

Wildlife Species Observed within the Survey Area

Scientific Name	Common Name	Status	Native, Introduced, or Domesticated
Aspidoscelis tigris	western whiptail lizard	Common	Native
Campylorhynchus brunneicapillus	cactus Wren	Common	Native
Corvus corax	common raven	Common	Native
Crotalus scutulatus	Mohave rattlesnake	Common	Native
Dipodomys sp.	kangaroo rat	Common	Native
Gambelia wislizenii	long-nosed leopard lizard	Common	Native
Haemorhous mexicanus	house finch	Common	Native
Lanius ludovicianus	loggerhead shrike	CDFW Species of Special Concern	Native
Lepus californicus	black-tailed jackrabbit	Common	Native
Mimus polyglottos	northern mockingbird	Common	Native
Myiarchus cinerascens	ash-throated flycatcher	Common	Native
Spizella breweri	Brewer's sparrow	Common	Native
Troglodytes aedon	house wren	Common	Native
Uta stansburiana	side-blotched lizard	Common	Native
Zenaida macroura	mourning dove	Common	Native
Zonotrichia leucophrys	white-crowned sparrow	Common	Native

Appendix C4
Protocol Western Burrowing Owl Survey Report

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Western Burrowing Owl Habitat Assessment and Survey Report for the Proposed Euismod Project Willow Springs, Kern County, California Spring 2025

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EXECUTIVE SUMMARY

In April through June 2025, personnel from Aardvark Biological Services, LLC conducted a western burrowing owl (*Athene cunicularia hypugaea*) (burrowing owl) literature review, habitat assessment, and surveys for the Proposed Euismod Project (Proposed Project) in Willow Springs, Kern County, California. The surveys encompassed the 120-acre Proposed Project, two short overhead electric tie-line routes to the south of the Proposed Project, and a 500-foot (ft) buffer. The following is the summarized results of the findings. There was (were):

- Five burrowing owl occurrence records from previous years outside the Proposed Project and 500-ft buffer in the literature review (CDFW 2025)
- No burrowing owl occurrence records from previous years inside the Proposed Project and 500-ft buffer in the literature review (CDFW 2025)
- No burrowing owls observed during 2024 field surveys inside the Proposed Project and 500-ft buffer in the literature review (Rincon 2025)
- No burrowing owls observed during 2025 field surveys inside the Proposed Project and 500-ft buffer
- Three suitable burrows observed (two with old whitewash) inside the Proposed Project and 500-ft buffer during 2025 surveys
- No new burrowing owl sign (whitewash, pellets, feathers, tracks, etc.) observed during 2025 surveys
- Habitat comprised of mature, tall, creosote bush (*Larrea tridentata*) scrub alliance with sporadic western Joshua trees (*Yucca brevifolia*)
- Numerous burrowing owl predators observed during 2025 surveys

The results indicate that burrowing owls were not present or occupying the Proposed Euismod Project or 500-ft buffer in the breeding season in 2025. This does not preclude burrowing owls from being present or occupying during the 2025 non-breeding season or in subsequent non-breeding or breeding seasons. However, with no known previous occurrences of live individuals, few suitable burrows observed, two consecutive years of surveys with no live burrowing owl occurrences, as well as other supporting factors such as low habitat suitability for the Proposed Project and 500-ft buffer, there is a low potential for burrowing owls being present or occupying the Proposed Project in the future.

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PROJECT BACKGROUND

Project Location

The Proposed Euismod Project (Proposed Project) comprises approximately 120 acres located in the west Mojave Desert, in the Willow Springs area, west of Rosamond, Kern County, California (Figure 1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The terrain is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. The Proposed Project location is shown in Figures 1 and 2. It lies north of the Southern California Edison (SCE) Whirlwind Substation and is bordered to the east by 170th Street West. To the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Proposed Project where it continues as a dirt road. The northernmost end of the Proposed Project is bordered by an unnamed dirt road. There are solar installations to the south and east of the Proposed Project and a wind energy generation development to the northeast. The Proposed Euismod Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle) (Township 9N, Range 15W – a portion of the south half of Section 14).

Selected representative photographs for the Proposed Euismod Project are provided in Appendix A Photos (Photos 1-3).

Project Description

The Proposed Euismod Project would utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available such as from renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures connected to an onsite substation, that interconnects with the regional electric grid at the Whirlwind 220kV substation to the south of the Proposed Project.

Western Burrowing Owl Background

The western burrowing owl (*Athene cunicularia hypugaea*) is one of two subspecies of burrowing owls in North America and is the only subspecies that occurs in California. In California, the "western burrowing owl" and "burrowing owl" names are commonly used interchangeably when discussing *Athene cunicularia hypugaea*, as burrowing owl life history and behavior are largely the same across subspecies. Both names will be used interchangeably in this report.

The burrowing owl is a small, long-legged, and short-tailed owl, with adults typically 7.5-9.8 inches tall, having 20-24 inches wingspan, and weighing 0.33 pounds. They are a ground-dwelling raptor that requires burrows or other cavities for nesting, roosting, and cover (CDFG 2012, Henderson and Trulio 2014). Although they have been known to dig their own burrows, typically they use or



Figure 1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, California.

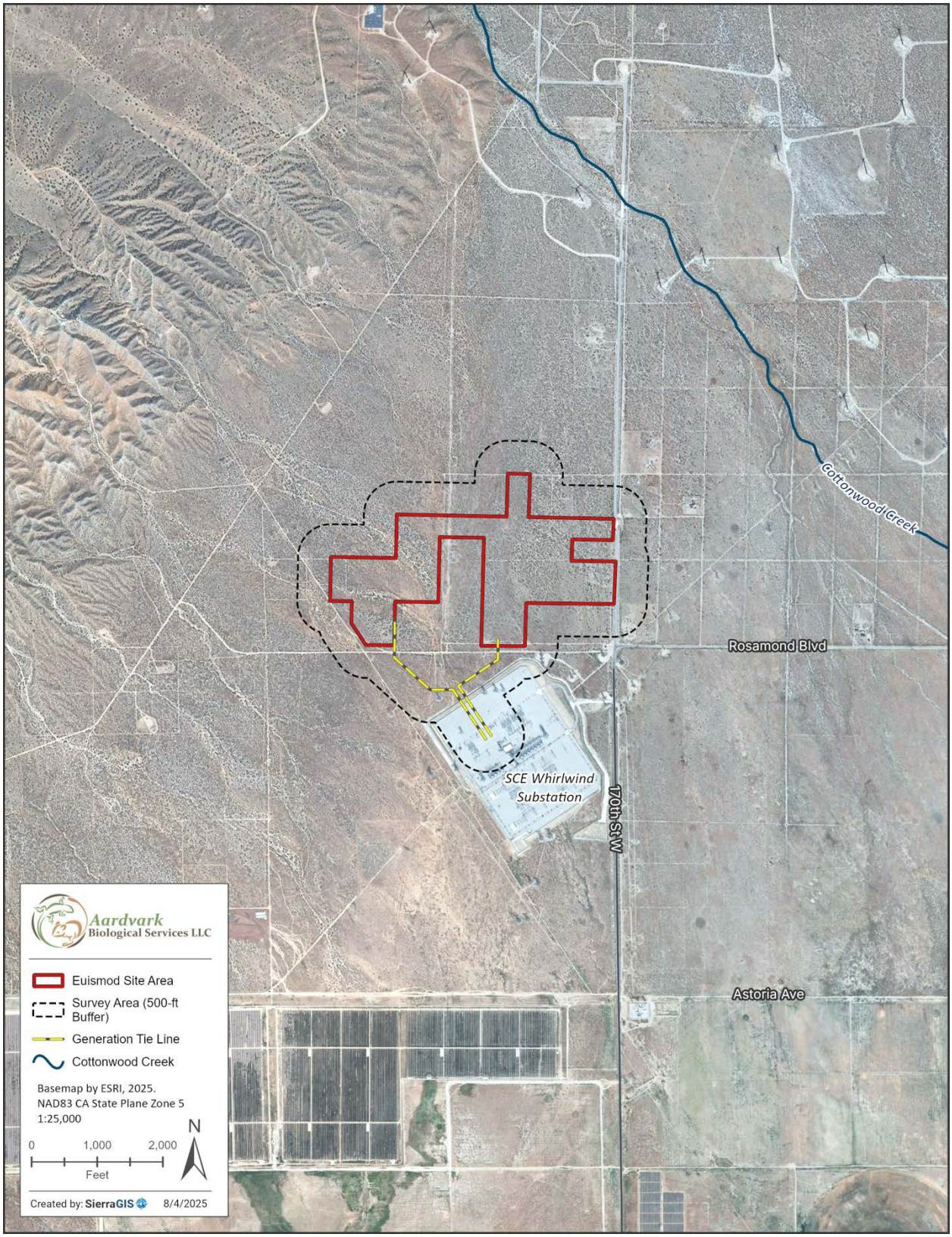


Figure 2. Proposed Euismod Project Location Map, Willow Springs, Kern County, California.

Western Burrowing Owl Background (continued)

modify burrows dug by other fossorial animals. In California, burrowing owls are known to use burrows dug by California ground squirrel (*Spermophilus beecheyi*), round-tailed ground squirrel (*Citellus tereticaudus*), American badger (*Taxidea taxus*), coyote (*Canis latrans*), desert tortoise (*Gopherus agassizzi*), and foxes (*Vulpes* spp.). Rock cavities, and natural burrow and cavity surrogates such as drainage pipes, debris piles, and culverts are also known to be used by burrowing owls (CDFG 2012).

Burrowing owls prefer open, relatively flat expanse habitats with short vegetation. In California, burrowing owl historic preferred habitat is grassland, shrub steppe (arid, patchwork of grasses and shrubs), and desert (CDFG 2012, Gervais et al. 2008). In more recent years, burrowing owls have been often found to utilize agricultural fields, and disturbed areas that still have the vegetation structure, useable natural burrow/cavity or natural burrow/cavity surrogates, and foraging habitat nearby, of historic preferred habitats (CDFG 2012, Gervais et al. 2008).

Burrowing owls are known to utilize multiple burrows, often referred to as satellite burrows, in the same vicinity for nesting and roosting. They are also known to have moderate to strong site fidelity, and will return year-to-year to the same burrows and areas they have previously utilized (Gervais et al. 2008). Surrounding habitat is also of importance for foraging grounds and dispersal of young (CDFG 2012). Burrowing owls are known to forage on arthropods, small rodents, amphibians, reptiles, and carrion (CDFG 2012, Klute et al. 2003).

Known predators of burrowing owls include, but are not limited to domestic dog, American badger (*Taxidea taxus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), fox (*Vulpes* spp.), Swainson's (*Buteo swainsoni*), red-tailed (*Buteo jamaicensis*), and Cooper's hawks (*Astur cooperii*), merlin (*Falco columbarius*), prairie (*Falco mexicanus*), and peregrine falcons (*Falco peregrinus*), great horned owl (*Bubo virgnianus*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), northern harrier (*Circus hudsonius*), gopher snakes (*Pituophis catenifer*), and rattlesnakes (*Crotalus* spp.) (Henderson and Trulio 2014, Klute et al. 2003).

In California, the non-breeding season for burrowing owls is generally considered to be from September 1 through January 31 and the breeding season to be from February 1 through August 31, with peak breeding season April 15 through July 15 (CDFG 2012). Burrowing owls can occur in California seasonally or as year-round residents – for breeding, wintering, and/or migrating (CDFG 2012, Gervais et al. 2008).

Burrowing owls have been listed as a Bird of Conservation Concern since 2002, by the United States Fish and Wildlife Service (USFWS) and are protected under the federal Migratory Bird Treaty Act. The western burrowing owl has been listed as Species of Special Concern since 1978, by the

California Department of Fish and Wildlife (CDFW). Since 2024, the western burrowing owl has been under review by CDFW as a candidate for listing under California Endangered Species Act.

Burrowing owl population declines are primarily a result of past and ongoing habitat loss, degradation, and fragmentation. Examples of this include anthropogenic contributions to loss of prey base such as rodent control programs, mortalities from vehicular strikes and wind turbines, and destruction of burrows from ground disturbance related to development, agricultural, and weed control measures (CDFG 2012, Gervais et al. 2008, Klute et al. 2023).

METHODS

Literature Review

Prior to conducting surveys, a literature review was conducted. The results from a 2024 *Habitat Assessment and Burrow Survey Report for Western Burrowing Owl, Desert Kit Fox, and American Badger* by Rincon Consultants, Inc. (Rincon 2025), prepared for the Proposed Euismod Project, and a California Department of Fish and Wildlife California Natural Diversity Database (CNDDB) records report (CDFW 2025) for the Proposed Project and a 5-mile buffer were reviewed.

Habitat Assessment and Surveys

The western burrowing owl habitat assessment and surveys were conducted following guidance for breeding season surveys from the *Staff Report on Burrowing Owl Mitigation* (CDFG 2012) by Aardvark Biological Services, LLC. Preferred timeframes for conducting the habitat assessment and for Survey 1 are between February 15 to April 15, and for Survey 2-4 are between April 15 and July 15, at least three weeks apart, and with at least one Survey conducted after June 15. On April 7-10, 2025 biologists Corey Chan and Crissy Slaughter conducted the initial habitat assessment and burrowing owl survey (Survey 1) using 10-meter-wide belt transects for the 120-acre Proposed Euismod Project footprint and a 100-ft buffer. 20-meter-wide belt transects were used to cover an additional 400-ft buffer (equating to 500-ft in total), when feasible and not limited by private property. On May 6, 2025 biologist Corey Chan conducted an additional initial habitat assessment and survey using the same methodology to capture the approximate 10-acre increased southern footprint of the Proposed Euismod Project gen-tie line and associated 500-ft buffer. Additional burrowing owl surveys (Surveys 2-4) were conducted on April 17, May 13, and June 16, 2025 by biologist Corey Chan, focused on any potential burrowing owl burrows or suitable burrows, and the surrounding habitat, that were observed in the initial habitat assessment and survey. This involved conducting one-to-two-hour survey observations at any suitable burrows, as well as 10 to 20-meter-wide belt transects in an approximate 1000-ft radius surrounding each burrow.

Observations of the general habitat and vegetation for the Proposed Euismod Project, and any burrowing owl sign, individuals, and suitable burrows were recorded. Burrowing owl sign includes whitewash, pellets, feathers, tracks, etc. Any observations of burrowing owl predators were also recorded. Surveyors had high quality binoculars and spotting scopes, and stopped and scanned at the end and beginning of every transect, or at least every 100 meters. During re-visits to suitable burrows, surveyors would observe from as far away as feasibly possible to limit disturbing potential burrowing owl behavior. Attention was also paid to listening for burrowing owl vocalizations.

RESULTS

Literature Review

The 2024 field survey results of the habitat assessment and burrow survey conducted over four days by Rincon Consultants, Inc. for the Proposed Euismod Project and a 500-ft buffer, reported having suitable habitat for burrowing owls, observing five burrows of suitable size for burrowing owls, and having no burrowing owls observed (Rincon 2025). One burrow was listed as a Class 3 desert tortoise burrow, which is defined as definitely desert tortoise, in deteriorated, including collapsed condition (USFWS 2009). The other four burrows were determined to be small mammal burrows, with one of the burrows listed as having whitewash present. Whitewash is white-colored, uric acid bird excrement indicative of potential past burrowing owl use. The burrow with whitewash was old, collapsed and determined to not currently be occupied by burrowing owls (Rincon 2025). The other four (desert tortoise and small mammal) burrows were determined to be inactive and had no evidence of burrowing owl use. This 2024 habitat assessment and burrow survey was conducted on April 9-11 and May 30, 2024.

The results of the CNDDB report for the Proposed Project and a 5-mile radius from the Proposed Euismod Project had five occurrences of burrowing owls (CDFW 2025). One occurrence was from 2010-2011, approximately 1.3 miles northeast from the Proposed Project, and had up to seven burrows and one to two individuals. Another occurrence from 2010-2011 was approximately 2.0 miles northeast from the Proposed Project and had three burrows with one individual. The two other occurrences were from 2007, approximately 2.1 miles and 2.45 miles south of the Proposed Project and each had observations of one burrow and one individual.

Habitat Assessment and Surveys

The following are results from the 2025 field surveys conducted by Aardvark Biological. The Proposed Euismod Project is composed of creosote bush (*Larrea tridentata*) scrub alliance with sporadic western Joshua trees (*Yucca brevifolia*) (Photos 1-3). The creosote bush shrubs are mature and irregularly spaced and commonly 8-10 ft tall. Other common shrubs include goldenhead (*Acamptopappus sphaerocephalus* var. *hirtellus*), burro bush (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), rubber rabbitbrush (*Ericameria nauseosa*), wire-lettuce (*Stephanomeria pauciflora*), spiny hope-sage (*Grayia spinosa*), desert tomato (*Lycium andersonii*), box-thorn (*Lycium cooperi*), and Nevada ephedra (*Ephedra nevadensis*). The annual and perennial herb layer is open and sparsely populated with patchy bare soil present. This is likely due to the lack of precipitation prior to the survey season. Common native species include common goldfields (*Lasthenia gracilis*), vinegar weed (*Lessingia glandulifera var.glandulifera*), and desert fiddleneck (*Amsinckia tessellata* var. *tessellata*) (Aardvark 2025b).

Non-native, weedy annual herbs and grasses were common, especially in previously disturbed areas (powerlines) and adjacent to dirt roads. Non-native Mediterranean grasses (*Schismus arabicus* or

Schismus barbatus), red brome (*Bromus rubens*), and cheatgrass (*Bromus tectorum*) were ubiquitous throughout the Proposed Project. Additionally, red-stemmed filaree (*Erodium cicutarium*) was abundant and Russian-thistle (*Salsola tragus*) was common throughout the Proposed Project (Aardvark 2025b).

High levels of anthropogenic disturbance were present throughout the Proposed Euismod Project, which included trash and debris, historic sheep grazing (sheep scat), established dirt access roads, and off-road motorcycle trails. See Appendix A Photos (Photos 4-6).

No burrowing owls were observed during the initial habitat assessment and surveys. During the initial habitat assessment and survey (Survey 1), three suitable burrows were observed (Figure 3). The first suitable burrow (Suitable Burrow 1) was in the northeast part of the Proposed Project. It was an old canid burrow with some old whitewash near the entrance (Photo 7). This is the same burrow that was identified in the 2024 surveys with whitewash (Rincon 2025). The other two suitable burrows (Suitable Burrow 2, Suitable Burrow 3) were observed in the buffer area surrounding the Proposed Project. Suitable Burrow 2 was near one of the proposed tie-line routes between the Proposed Project and the Whirlwind Substation and was an old canid burrow with old whitewash on the burrow mound (Photos 8, 9). Suitable Burrow 3 was 230 ft to the northwest of the Proposed Project and was an old canid burrow with no burrowing owl sign (Photo 10). The whitewash at Suitable Burrow 1 and 2 was determined to be not recent (old) due to its faded, washed-out appearance. All the suitable burrows were partially collapsed and two of the three were overgrown with vegetation (Suitable Burrow 1, 2). The other four burrows of suitable burrowing owl size that were observed in the 2024 habitat assessment and surveys (Rincon 2025) were not observed in the 2025 surveys and are assumed collapsed and/or no longer exist.

The additional burrowing owl surveys (Surveys 2-4) were focused on the three suitable burrows (Suitable Burrows 1-3) and an approximate 1000-ft radius surrounding each burrow (Photos 11-19). No burrowing owls or sign, and no new suitable burrows were observed. During Survey 4, Suitable Burrow 2 located in the buffer area near the Whirlwind Substation, was found collapsed, with the steep straight sloped edges and pattern around the burrow indicating it was likely from a shovel (Photo 18). Table 1 shows a summary of the western burrowing owl habitat assessment surveys results and weather conditions.

There were multiple observations of burrowing owl predators and predator sign during the burrowing owl habitat assessment and surveys on the Proposed Project and 500-ft buffer. Common ravens were observed during every survey day, a prairie falcon was observed once, and red-tailed hawks were observed three times. Predator sign observed included the three suitable burrows (Suitable Burrows 1-3) that were old canid digs, and coyote scat was also generally observed

throughout the Proposed Project and 500-ft buffer. Additionally, there were observations of an active common raven nest approximately 350-ft from the gen-tie line in the 500-ft buffer to the south of the Proposed Project, and an active great horned owl nest approximately 260-ft outside the 500-ft buffer to the southeast (Figure 3). Both nests were in lattice transmission towers (Photos 20, 21). The great horned owl nest was first observed during Swainson's hawk surveys for the Proposed Euismod Project on April 11, 2025 (Aardvark 2025c).

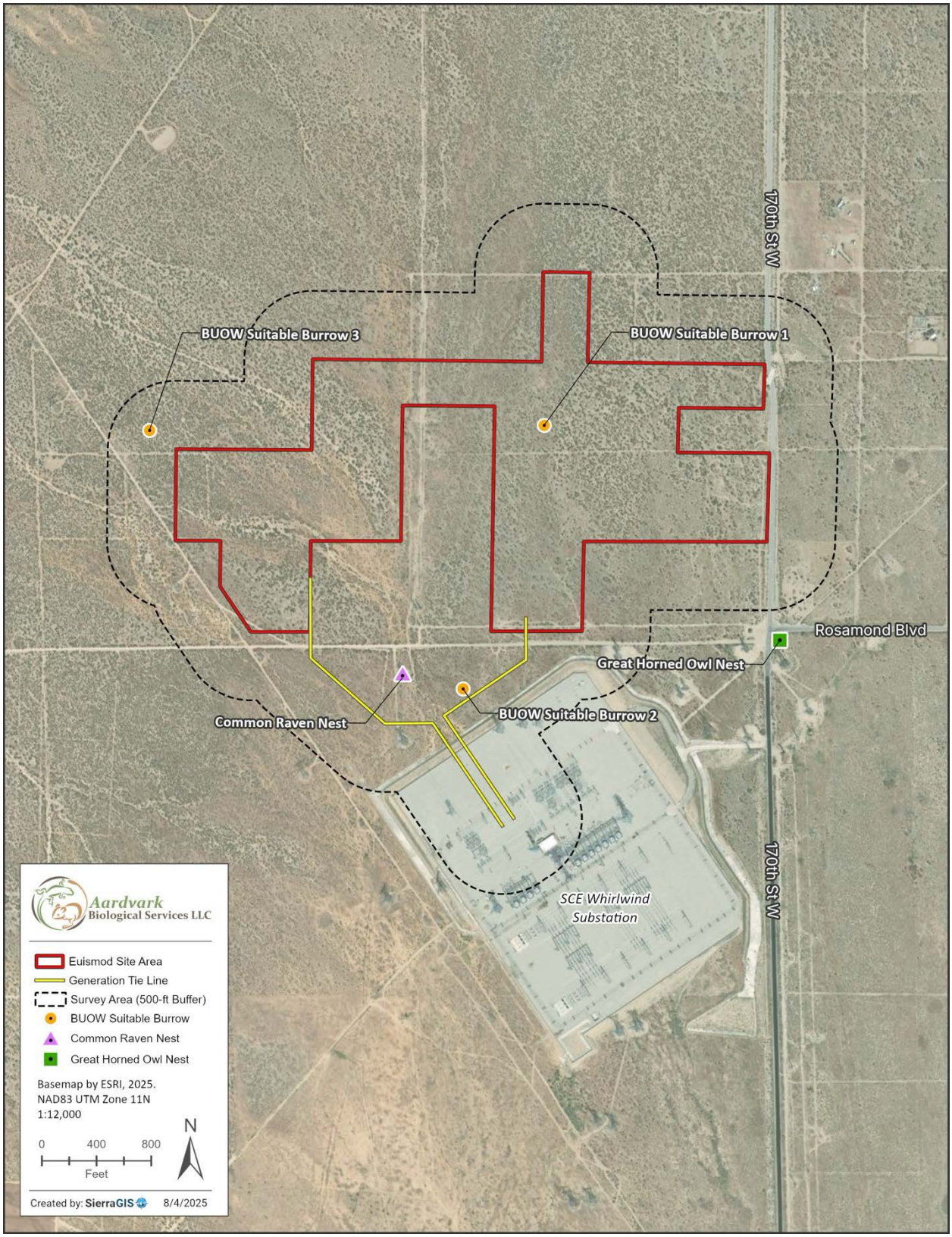


Figure 3. Proposed Euismod Project Suitable Burrows and Predator Nest Locations Map, Willow Springs, Kern County, California

Table 1. Summary of Western Burrowing Owl Habitat Assessment and Surveys Results and Weather Conditions

	Date	Time (start, end)	Ambient Temp (°F)	Wind (mph)	Cloud Cover (%)	Precipitation	Visibility	Western Burrowing Owl (BUOW) Survey Results (coordinates in UTMs, ft=feet, mm=millimeters)
Habitat Assessment and Survey 1	4/7/25	0900	60.7	2-3 E	10	none	unlimited	No BUOW individuals or sign, No suitable BUOW burrows observed
		1745	62.0	8-10 NW	10	none	unlimited	
	4/8/25	0800	60.7	9-15 W	10	none	unlimited	No BUOW individuals or sign, No suitable BUOW burrows observed
		1700	77.2	5-7 SW	0	none	unlimited	
	4/9/25	0700	62.2	0-1 variable	0	none	unlimited	No BUOW individuals, No recent BUOW sign, 1 suitable BUOW burrow observed (Suitable Burrow 1, with potential old BUOW sign - whitewash) Suitable Burrow 1 (368580 3859208) – onsite in NE, old whitewash near entrance, 220mm wide, 160mm height, unknown depth, old canid burrow, large apron with old whitewash, opens to N
		1600	85.4	5-7 SW	0	none	unlimited	
	4/10/25	1200	83.9	1.9 E	1	none	unlimited	No BUOW individuals, No recent BUOW sign, 2 suitable BUOW burrow in buffer observed (Suitable Burrow 2,3; Suitable Burrow 2 with potential old BUOW sign - whitewash) Suitable Burrow 2 (368388 3858624) - offsite 440 ft to S, 180mm wide, 300mm height, unknown depth, old canid burrow, large apron with old whitewash, opens to S Suitable Burrow 3 (3677003859213) - offsite 230 ft to NW, 220mm wide, 130mm height, unknown depth, old canid burrow, opens to SE, no BUOW sign
		1700	90.6	3-10 W	2	none	unlimited	
	5/6/25	1000	68	7-10 SE	6	none	unlimited	No BUOW individuals or sign, No suitable BUOW burrows
		1900	67	10-12 W	5	none	unlimited	
Survey 2	4/17/25	0730	57	10-12 NW	5	none	unlimited	Continuing Surveys- No BUOW individuals or sign, No new suitable BUOW burrows observed Suitable Burrow 1 - onsite, no BUOW individuals, no new BUOW sign observed Suitable Burrow 2, 3 - offsite in buffer, no BUOW individuals, no new BUOW sign observed
		1100	61	8-12 NW	5	none	unlimited	
Survey 3	5/13/25	0630	51	4-6 W	10	none	unlimited	Continuing Surveys- No BUOW individuals or sign, No new suitable BUOW burrows observed Suitable Burrow 1 - onsite, no BUOW individuals, no new BUOW sign observed Suitable Burrow 2, 3 - offsite in buffer, no BUOW individuals, no new BUOW sign observed
		1400	68	15-18 W	15	none	unlimited	
Survey 4	6/16/25	0630	66	5-7 W	5	none	unlimited	Continuing Surveys- No BUOW individuals or sign, No new suitable BUOW burrows observed Suitable Burrow 1 - onsite, no BUOW individuals, no new BUOW sign observed Suitable Burrow 2, 3 - offsite in buffer, no BUOW individuals, no new BUOW sign observed Suitable Burrow 2 - no longer exists, looks to be collapsed by shovels
		1600	96	15-20 W	0	none	unlimited	

DISCUSSION

Results of the 2025 burrowing owl literature review, habitat assessment, and surveys indicate that western burrowing owls were not present or occupying the Euismod Proposed Project or 500-ft buffer during the 2025 burrowing owl breeding season.

The 2025 literature review, including the 2024 habitat assessment and burrow survey report (Rincon 2025) and CNDDB report (CDFW 2025), established a history of no known previous observations or occurrences of live individuals within the Proposed Project or 500-ft buffer. The nearest occurrence was approximately 1.2 miles northeast from the Proposed Project in 2010-2011 from the CNDDB report.

Both the 2025 burrowing owl habitat assessment and surveys were conducted during the breeding season (Feb 1 to Aug 31), in the preferred timeframes, and the majority of preferred weather conditions (< 12.43 mph wind, >68 °F, good visibility) to maximize detection of burrowing owls (Table 1) (CDFG 2012). This is with the exception of the additional approximate 10-acres that was surveyed on May 6, 2025. For this area, the initial habitat assessment and Survey 1 were conducted outside of the preferred Feb 15 to April 15 timeframe (CDFG 2012), but due to this area being only 10-acres, having no burrowing owls, sign, or suitable burrows observed, and weather conditions were good, this is thought to be a minor deviation. Note that some of the 2024 surveys (Rincon 2025) were conducted in a more compressed timeframe than preferred (CDFG 2012).

The 2025 habitat assessment resulted in a determination that the Proposed Project and the 500-ft buffer is of low habitat suitability for burrowing owls. This is reflected in the habitat composition (tall shrub cover), the high number of observations of burrowing owl predators, and the limited number of suitable burrows observed. The habitat is composed of creosote bush scrub alliance with sporadic western Joshua trees - with the creosote bush being mature, irregularly spaced, and commonly 8-10 foot tall. This is counter to the open, with short vegetation habitat that burrowing owls prefer (CDFG 2012, Gervais et al. 2008). During the habitat assessment and surveys, there were numerous observations of burrowing owl predators on the Proposed Project and 500-ft buffer including one prairie falcon, three red-tailed hawks, common ravens daily during surveys, an active common raven nest, an active great horned owl nest, canid digs, and coyote scat. Additionally, only three suitable burrows were observed, with two of the three being overgrown with vegetation and all three being partially collapsed. This robust number of predators and predator sign, and the low number of suitable burrows observed also supports the determination of low habitat suitability for burrowing owls.

Burrowing owl surveys were conducted in spring 2025 for the Proposed Euismod Project and a 500-ft buffer; however, no burrowing owls were observed despite the observation of three suitable burrows, two of which also had old whitewash (Suitable Burrow 1, 2), which is indicative of past potential burrowing owl use. The three suitable burrows and the whitewash were first observed during the burrowing owl habitat assessment and Survey 1. During the subsequent Surveys 2-4, no burrowing owl individuals or new sign were observed at the three suitable burrows or the 1000-ft radius around each burrow. Whitewash is considered a type of burrowing owl sign (CDFG 2012); however, because whitewash also can be from other birds, and no new whitewash or other burrowing owl sign (pellets, feathers, tracks, etc.) were observed at the burrows during any of the subsequent surveys, it is not conclusive that it is from burrowing owls. Additionally, the three suitable burrows would all require significant additional digging for occupancy, as they were all partially collapsed and two of the three were overgrown with vegetation (Suitable Burrow 1, 2), which reinforces no recent burrowing owl presence or occupation.

Having burrowing owls not present or occupying the Proposed Euismod Project or 500-ft buffer during the 2025 burrowing owl breeding season, does not preclude burrowing owls from being present or occupying during the 2025 non-breeding season or in subsequent non-breeding or breeding seasons. However, with no known previous occurrences of live individuals, few suitable burrows observed, two consecutive years of surveys with no live burrowing owl occurrences, as well as other supporting factors such as low habitat suitability for the Proposed Project and 500-ft buffer, there is a low potential for burrowing owls being present or occupying the Proposed Project in the future.

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APPENDIX A
PHOTOS



Photo 1. Representative view of the habitat on the Proposed Euismod Project.



Photo 2. A second representative view of the habitat on the Proposed Euismod Project.



Photo 3. Additional representative view of the habitat on the Proposed Euismod Project.

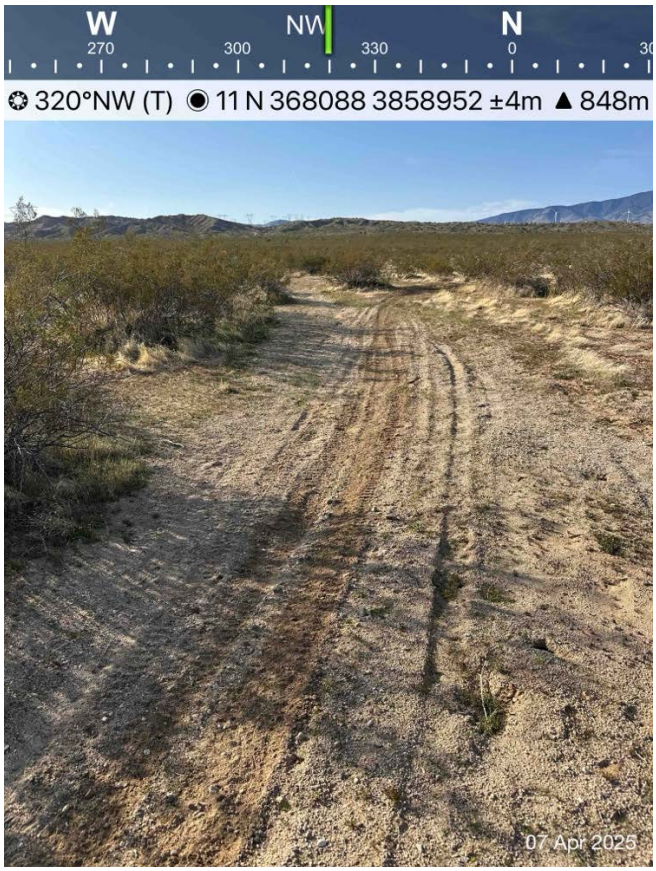


Photo 4. View of offroad trail on the Proposed Euismod Project.

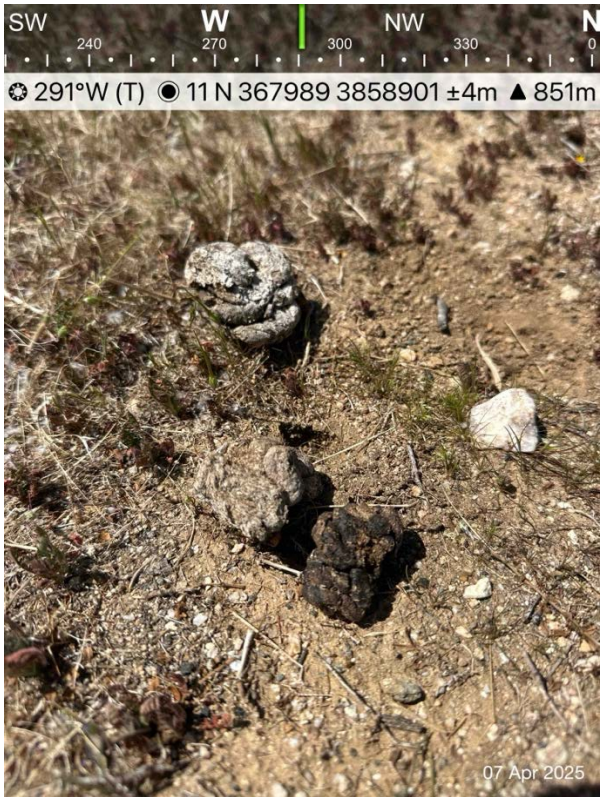


Photo 5. Example of sheep scat found throughout the Proposed Euismod Project.

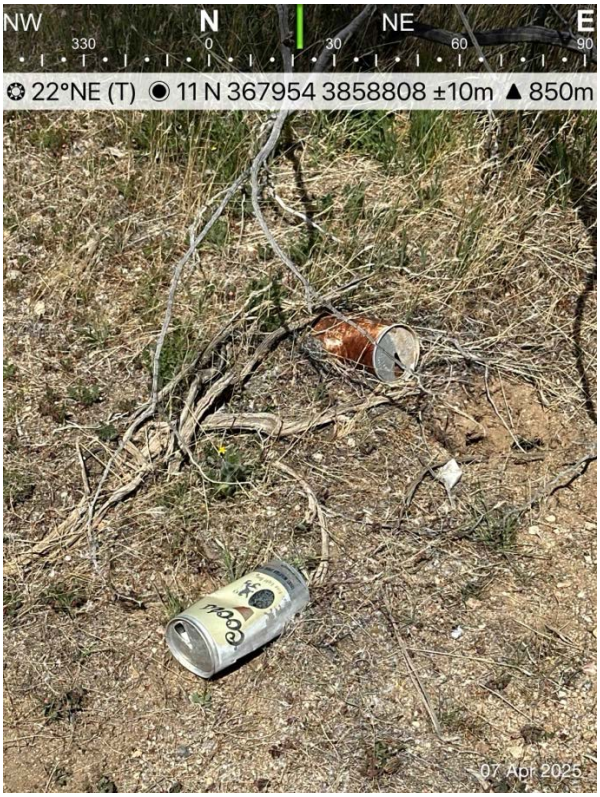


Photo 6. Example of trash found throughout the Proposed Euismod Project.

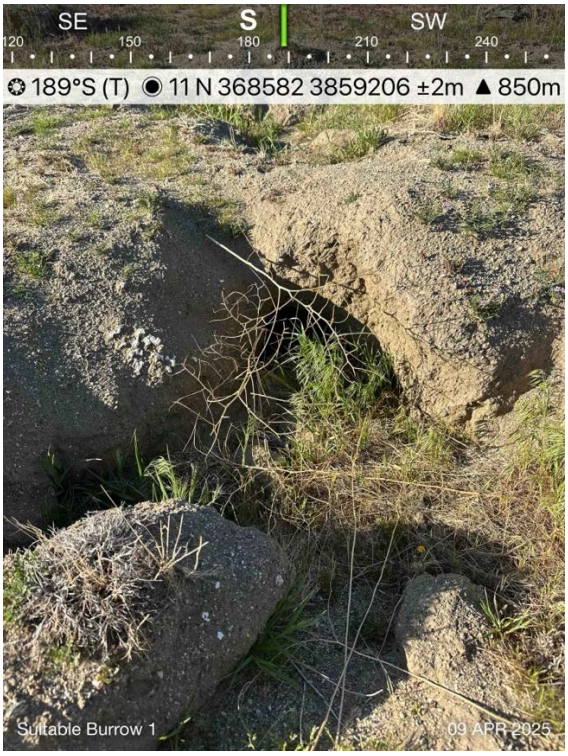


Photo 7. View of Suitable Burrow 1 on 04/09/2025 during the initial Burrowing Owl Habitat Assessment and Survey 1 on the Proposed Euismod Project. Whitewash can be seen on the left side of the photo near the burrow entrance.



Photo 8. View of Suitable Burrow 2 on 04/10/2025 during the initial Burrowing Owl Habitat Assessment and Survey 1 on the Proposed Euismod Project and 500-ft buffer.

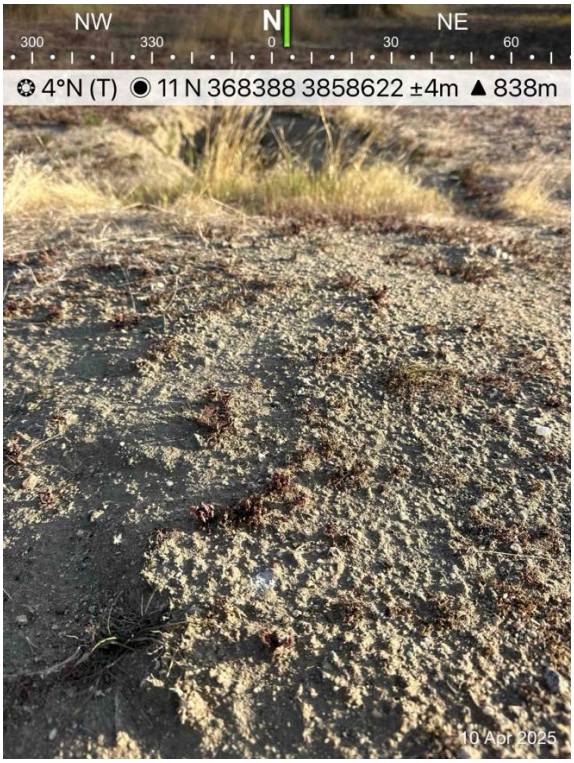


Photo 9. View of whitewash, in foreground, at Suitable Burrow 2 on 04/10/2025 during the initial Burrowing Owl Habitat Assessment and Survey 1 on the Proposed Euismod Project and 500-ft buffer.



Photo 10. View of Suitable Burrow 3 on 04/10/2025 during the initial Burrowing Owl Habitat Assessment and Survey 1 on the Proposed Euismod Project and 500-ft buffer.



Photo 11. View of Suitable Burrow 1 on 04/17/2025 during Burrowing Owl Survey 2 on the Proposed Euismod Project.



Photo 12. View of Suitable Burrow 2 on 04/17/2025 during Burrowing Owl Survey 2 on the Proposed Euismod Project and 500-ft buffer.

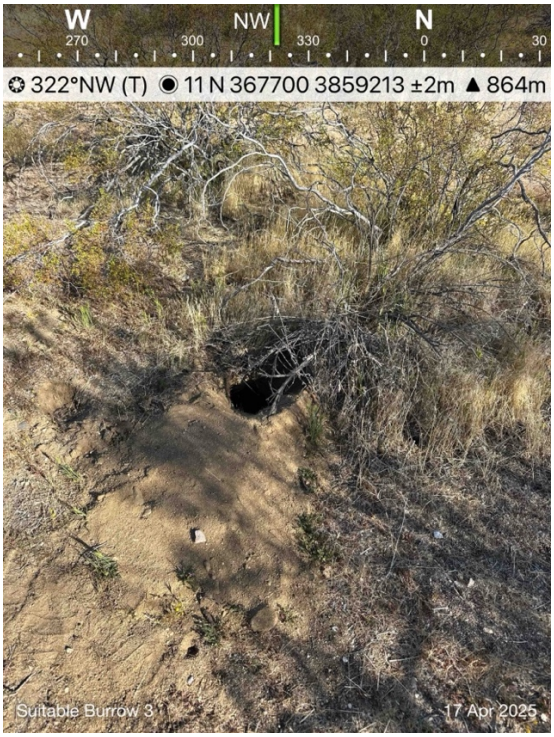


Photo 13. View of Suitable Burrow 3 on 04/17/2025 during Burrowing Owl Survey 2 on the Proposed Euismod Project and 500-ft buffer.



Photo 14. View of Suitable Burrow 1 on 05/13/2025 during Burrowing Owl Survey 3 on the Proposed Euismod Project.



Photo 15. View of Suitable Burrow 2 on 05/13/2025 during Burrowing Owl Survey 3 on the Proposed Euismod Project and 500-ft buffer.



Photo 16. View of Suitable Burrow 3 on 05/13/2025 during Burrowing Owl Survey 3 on the Proposed Euismod Project and 500-ft buffer.



Photo 17. View of Suitable Burrow 1 on 06/16/2025 during Burrowing Owl Survey 4 on the Proposed Euismod Project.



Photo 18. View of Suitable Burrow 2 on 06/16/2025 during Burrowing Owl Survey 4 on the Proposed Euismod Project and 500-ft buffer.



Photo 19. View of Suitable Burrow 3 on 06/16/2025 during Burrowing Owl Survey 4 on the Proposed Euismod Project and 500-ft buffer.

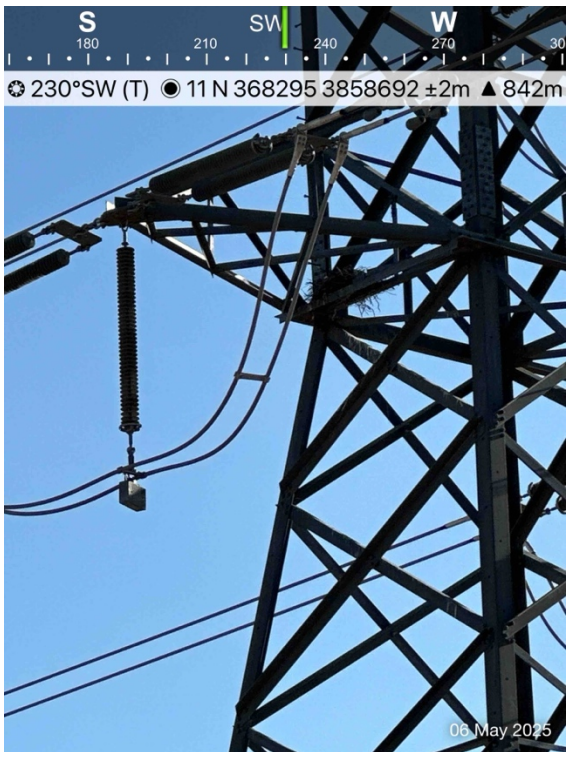


Photo 20. View of active common raven nest on transmission tower on 05/06/2025 during Burrowing Owl Survey 1 on the Proposed Euismod Project.

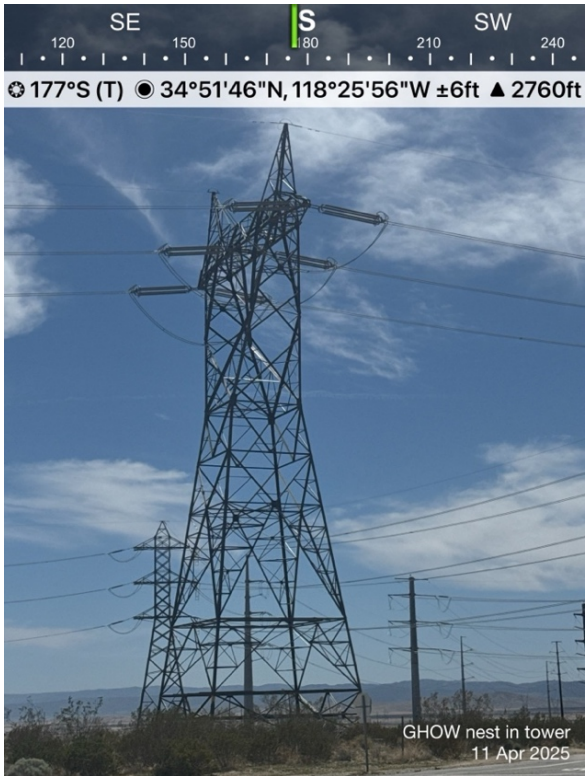


Photo 21. View of active great horned owl nest, on the upper portion of a transmission tower on 04/11/2025 during Swainson's Hawk protocol surveys for the Proposed Euismod Project.

Appendix C5
Protocol Desert Tortoise Survey Report

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Rincon Consultants, Inc.
250 East 1st Street, Suite 1400
Los Angeles, California 90012
213-788-4842

January 28, 2025
Project No: 23-14888

Joe Stenger, P.G.
Program Director, Renewables Delivery Team
TRC Solutions
2666 Rodman Drive
Los Osos, California 93402
Via email: jstenger@trccompanies.com

Subject: Desert Tortoise Survey Report for the Euismod BESS Project, Kern County, California

Dear Mr. Stenger:

Rincon Consultants, Inc. (Rincon) conducted a focused survey for Mojave desert tortoise (*Gopherus agassizii*), a species listed as Threatened under the U.S. Endangered Species Act, in support of the Euismod Battery Energy Storage System (BESS) Project (project). The project involves development of a BESS site and associated access roads in unincorporated Kern County, California. The desert tortoise focused survey was conducted to ensure proper analysis of potential impacts to the species from project activities. The report herein describes the results of the focused desert tortoise survey.

Project Location and Description

The project is generally located in the southern portion of unincorporated Kern County on the eastern side of the Tehachapi Mountains (Attachment 1; Figure 1). The Project Land Holdings include approximately 120 acres of undeveloped land located approximately 16 miles west of the unincorporated community of Rosamond and 20 miles northwest of the city of Lancaster.

The project proposes to develop a BESS site and associated access roads on the Project Land Holdings in eastern Kern County, California (Attachment 1; Figure 2). The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Southern California Edison Whirlwind 220 kilovolt (kV) substation located approximately 0.3 mile to the southeast. Batteries associated with the project would be contained on site in outdoor enclosures. An access road would connect the site to the nearest public road at 170th Street.

Methods

This section describes methods for literature review/desktop evaluation and focused survey for desert tortoise in the Project Land Holdings and a 500-foot buffer (Survey Area).

Background and Literature Review

Prior to the survey, a review of available literature was conducted to determine whether desert tortoise have been previously reported within the Survey Area and the surrounding USGS 7.5-minute topographic quadrangles: *Fairmont Butte, Liebre Twins, Tylerhorse Canyon, Willow Springs, Neenach School, Little Buttes, Burnt Peak, Lake Hughes, and Del Sur, California*. The California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB; CDFW 2024a), and Biogeographic Information and Observation System (BIOS; CDFW 2024b) were reviewed, in addition

to the *Preparing For Any Action That May Occur Within The Range Of The Mojave Desert Tortoise* (*Gopherus agassizii*) (United States Fish and Wildlife Service [USFWS] 2019).

Field Survey

Two focused desert tortoise surveys were conducted on April 9 to 11, 2024, and May 30, 2024 to capture the entire Survey Area. Rincon biologists Jose Lopez and Stephanie Tam conducted the first focused desert tortoise survey on April 9, 10, and 11, 2024. Rincon biologists Jose Lopez and Ben Chubak conducted the second focused desert tortoise survey May 30, 2024. On April 9, weather conditions included clear skies, temperatures ranging from 59 degrees Fahrenheit (°F) in the morning to 78 °F in the afternoon, and wind speeds up to 9 miles per hour (mph). Conditions on April 10 were also clear, with a temperature of 66 to 81°F, and wind speeds up to 5 mph. The survey day on April 11 had similar conditions with clear skies, 57 to 81°F in temperature, and wind speeds up to 6 mph. Conditions during the May 30 survey were clear with a temperature range of 58 to 87°F and wind speeds of up to 9 mph.

The survey adhered to the methodology outlined for Small Project Surveys (less than 65 hectares) as described in *Preparing For Any Action That May Occur Within The Range Of The Mojave Desert Tortoise (Gopherus agassizii)* (USFWS 2019). Biologists followed 10-meter (approximately 30-foot) belt transects to achieve 100 percent visibility of potentially suitable habitat. The 500-foot buffer area on adjacent private properties was surveyed using belt transects in locations where permission was granted by the property owners. For areas where permission was not obtained, surveys were conducted from within the Project Land Holdings using binoculars. Biologists documented potential desert tortoise observations or sign using ArcGIS Field Maps, took representative site photographs (Attachment 2), and noted general site characteristics, predominant vegetation communities, and observations of flora and fauna (Attachment 3). Site conditions were also recorded on each survey day.

Species Background

Desert tortoises reach 8 to 15 inches in length and 4 to 6 inches in shell height. Hatchlings emerge from eggs at about 2 inches in length. Adults have a domed carapace and relatively flat, lower shell. Their shells are high-domed and greenish-tan to dark brown in color. Adult desert tortoises weigh 8 to 15 pounds. The forelimbs have heavy, claw-like scales and are flattened for digging (Ernst et al. 1994).

Desert tortoises occupy a variety of desert habitats from flats and slopes dominated by creosote bush scrub at lower elevations to rocky slopes and juniper woodlands at higher elevations (Germano et al. 1994). Throughout most of the Mojave Desert, tortoises are most often found on gently sloping terrain with sandy-gravel soils and where there is sparse cover of low-growing shrubs, with sufficient grasses and forbs for foraging (USFWS 1994).

Desert tortoises are burrowing reptiles and spend much of their time underground. Peak activity is in the relatively moderate temperatures of the spring and fall when mating occurs (Rostal et al. 1994). They are long-lived and require 13 to 20 years to reach sexual maturity, in addition to having low reproductive rates.

Home ranges can vary greatly between years and locations. Typical home ranges for males extend 80 hectares (0.3 square mile) or more with females occupying half that area or less (Burge 1977, Berry 1986). Desert tortoises occur from below sea level and have been observed up to 7,300 feet.

The desert tortoise was listed as threatened under the California Endangered Species Act in 1989 and under the federal Endangered Species Act in 1980. Threats to desert tortoise include habitat loss, habitat degradation, disease, and predation. Loss of suitable desert habitat to urban expansion is the

primary means of habitat loss. Off-highway vehicle (OHV) use has resulted in degradation of habitat. The most common disease affecting desert tortoises is Upper Respiratory Tract Disease likely contracted from captive tortoises released into the wild. In addition, increased predation by ravens, following human expansion, has severely impacted the species.

Results

This section discusses results of the literature/desktop review and the focused desert tortoise survey.

Historical and Known Occurrences

The CNDDB search yielded three documented desert tortoise occurrences within a 9-quadrangle search around the Survey Area (CDFW 2024a). The closest occurrence was recorded in 2010, approximately 1 mile northwest of the Project Land Holdings. This record documented several Class 2 (good conditions; definitely desert tortoise) and Class 3 burrows (deteriorated or collapsed; definitively desert tortoise) in the area; however, there were no mentions of live desert tortoise sightings. The other two records consist of live desert tortoise observations dating back to 2006 (10 miles northeast) and 2009 (13 miles northeast).

The Survey Area does not contain USFWS-designated critical habitat for desert tortoises. The nearest critical habitat is situated approximately 30 miles east of the Survey Area.

Project Setting and Site Conditions

The Survey Area is dominated by creosote bush (*Larrea tridentata*)with areas of cheesebush (*Ambrosia salsola*) and sweetbush (*Bebbia juncea*). Creosote bush cover is dense throughout the Survey Area, except for the southwestern portion and some areas in the center. Western Joshua trees (*Yucca brevifolia*) are located sporadically throughout the Survey Area with no other trees present. Ground cover is characterized by dense mats of California goldfields (*Lasthenia californica)* and non-native species such as redstem stork's bill (*Erodium cicutarium*), Mediterranean grass (*Schismus barbatus*), red brome (*Bromus rubens*), and cheatgrass (*Bromus tectorum*). Additionally, a thick understory is prevalent beneath most shrubs, consisting primarily of the aforementioned ground cover species, alongside Sisymbrium (*Sisymbrium sp.*) and native plants like phacelias (*Phacelia sp.*). Although several washes intersect the Survey Area, their impact on species composition and dominance appears minimal. Signs of historical grazing activity are evident from old cow manure spread across the Survey Area, indicating previous land use. Furthermore, OHV trails and trail users were observed in the eastern portion of the Project Land Holdings.

The Survey Area is located on alluvial slopes on the south side of the Tehachapi Mountain range at elevations of approximately 2,750 to 2,830 feet above mean sea level. The ground surface slopes gently to moderately in a northwest to southeast direction.

Focused Desert Tortoise Survey

No desert tortoises and no signs of tortoise presence (tracks, scat) were observed in the Survey Area during the focused survey. However, one Class 3 burrow (deteriorated or collapsed; definitively desert tortoise) was identified in the southwest portion of the Project Land Holdings (Attachment 1; Figure 3). Although the burrow was collapsed and aged, it retained the characteristic half-moon shape and flat bottom typical of desert tortoise burrows. No desert tortoise or other animal scat or signs were observed within or around the burrow. Additionally, four Class 5 burrows (deteriorated or collapsed; possibly desert tortoise) were encountered during the survey. These burrows were also collapsed and old, showing no evidence of desert tortoise use. No evidence of use by other wildlife was observed,

except for the burrow located close to the center of the Project Land Holdings, where rabbit scat was observed around the mouth of the burrow. Additionally, one of the two burrows found near the center of the Survey Area had whitewash along the mouth, indicating potential previous use by burrowing owl (*Athene cunicularia*). No other active or inactive burrows were observed within the Survey Area, aside from those of small rodents.

The plant and wildlife species observed during the survey are detailed in Attachment 3. No federally or State-listed species were observed during the desert tortoise survey.

Conclusion and Recommendations

The Project Land Holdings encompass suitable habitat for desert tortoises, as evidenced by the presence of a Class 3 burrow within the Survey Area, indicating past use by desert tortoises. However, the absence of recent desert tortoise burrows or signs suggests a potential lack of current desert tortoise presence in the area. While it is possible that dense ground vegetation cover may have concealed some inactive burrows and desert tortoise signs (such as scat), areas devoid of vegetation (such as the mouth and apron of most active burrows) are typically more conspicuous under these conditions. Thus, it is unlikely that active burrows were overlooked. Given this, in addition to the Class 2 and 3 burrows documented in the CNDDB one mile northeast of the Project Land Holdings, the presence of apparently suitable habitat within the Survey Area, and the absence of significant barriers to dispersal from other known populations in the region, it can be inferred that the Project Land Holdings have a moderate potential to support desert tortoises.

It is recommended that a pre-construction survey for desert tortoises be conducted before the commencement of construction activities. Depending on the survey results, coordination with Agency biologists may be necessary to establish appropriate mitigation measures for the project prior to and during construction.

Thank you for the opportunity to support the Euismod BESS project. Please do not hesitate to contact Lisa Zumwalde (lzumwalde@rinconconsultants.com) at 562-822-9776 for questions about the contents of this report.

Sincerely,
Rincon Consultants, Inc.



Lisa Zumwalde
Senior Biologist/Project Manager



Brenna Vredeveld, MESc
Supervising Biologist



David Daitch, PhD
Vice President, Natural Resources

Attachments

Attachment 1 Figures
Attachment 2 Representative Site Photographs
Attachment 3 Floral and Faunal Compendium

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Attachment 1

Figures

Figure 1 Regional Vicinity

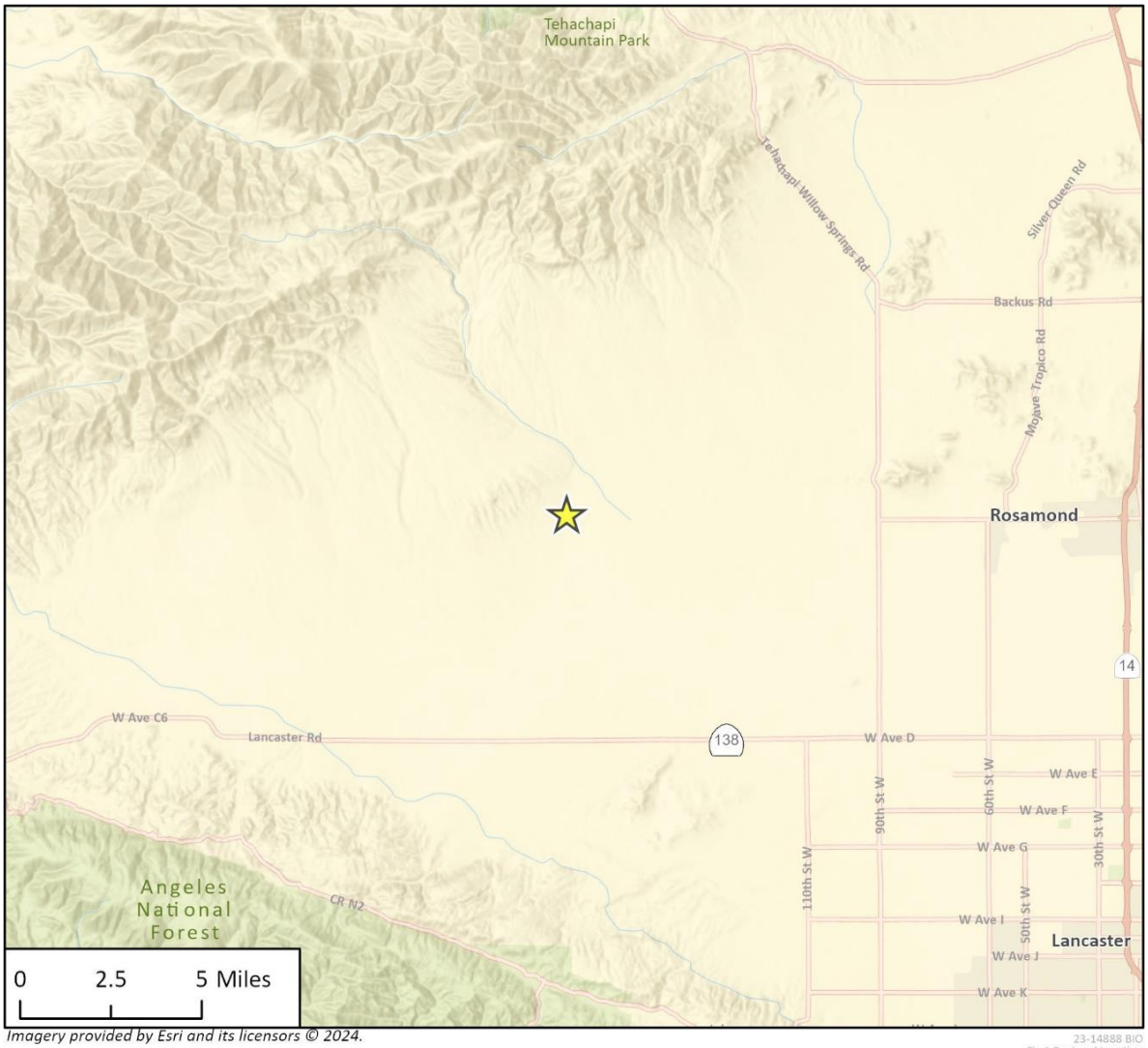
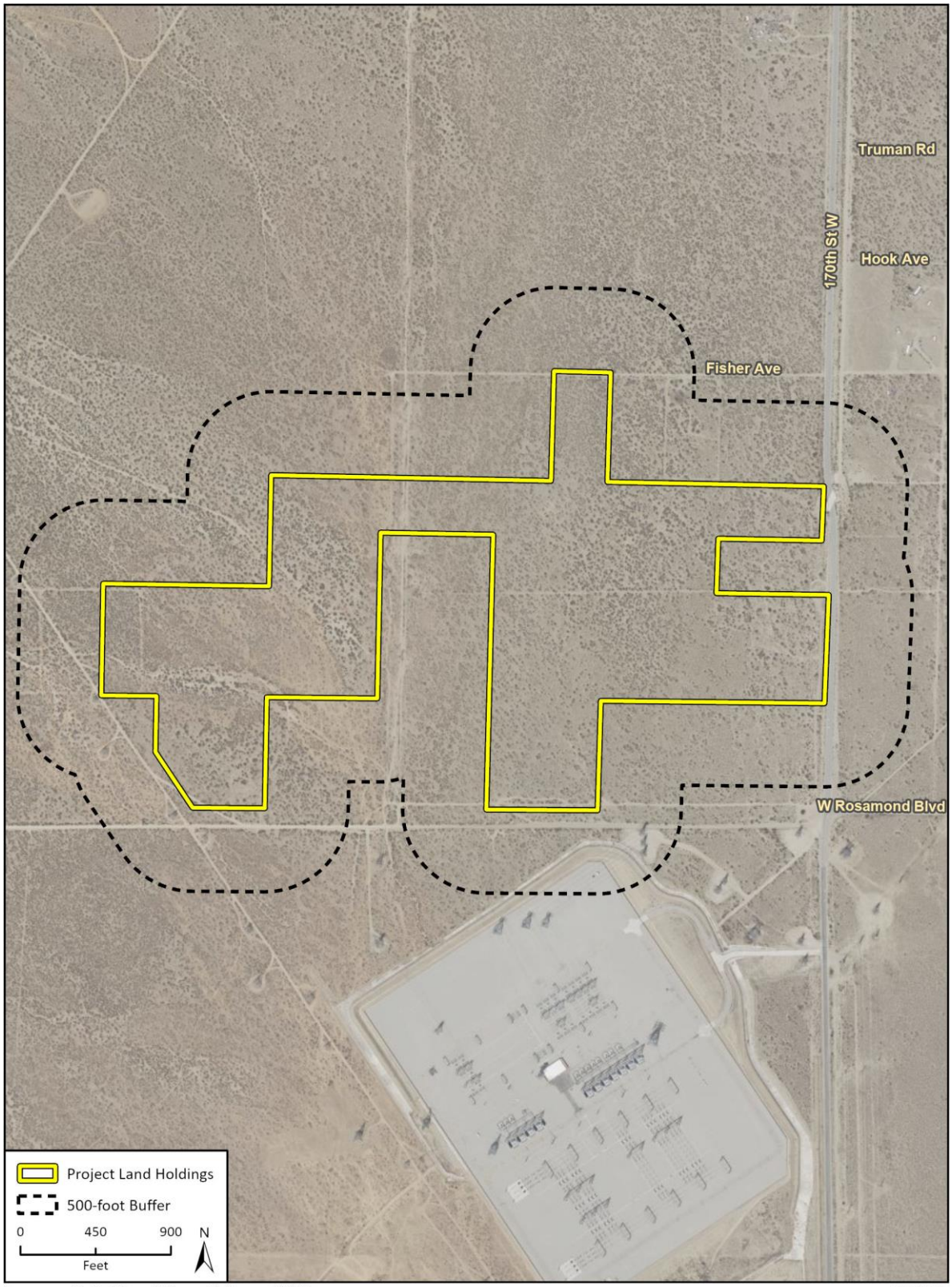


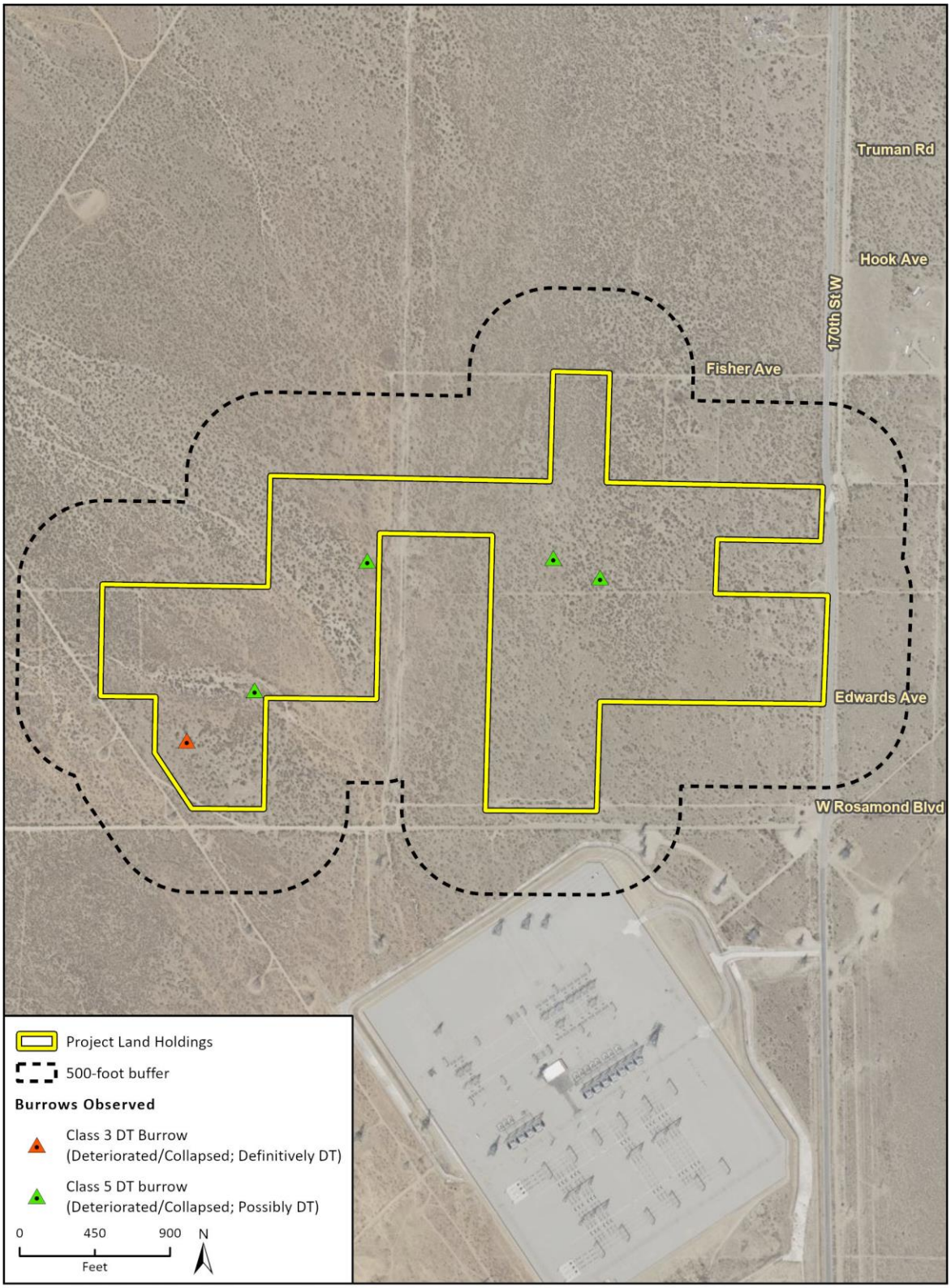
Figure 2 Project Land Holdings and Survey Area



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Fig 2 Survey Area

Figure 3 Burrow Observations



Attachment 2

Representative Site Photographs



Photograph 1. View of the Project Land Holdings from the western corner, facing south.



Photograph 2. View of the Project Land Holdings from the southwest corner, facing north.



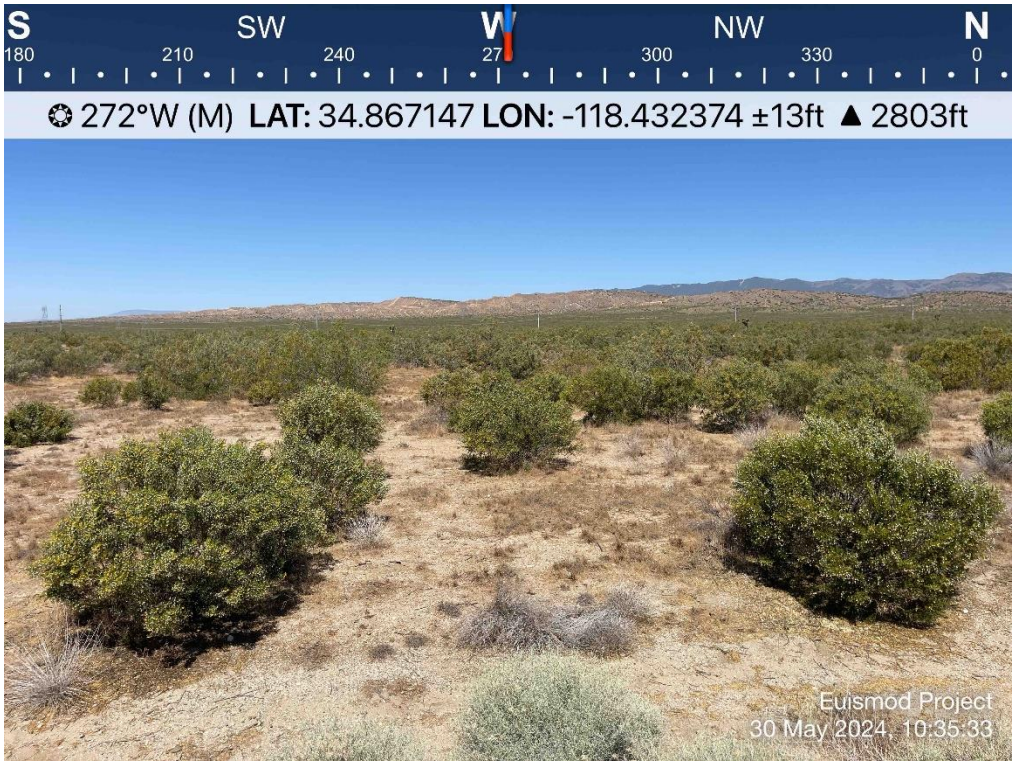
Photograph 3. View of the Project Land Holdings from the northwest corner, facing south.



Photograph 4. View of the Project Land Holdings from the northcentral corner, facing south.



Photograph 5. View of the Project Land Holdings from the southcentral corner, facing north.



Photograph 6. View of the Project Land Holdings from the eastern corner, facing west.



Photograph 7. View of the off-road trail, northern corner of the Project Land Holdings, facing south.



Photograph 8. View of the cheesebush scrub, eastern section of the Project Land Holdings, facing north.



Photograph 9. View of western Joshua trees, eastern section of the Project Land Holdings, facing northeast.



Photograph 10. Class 3 burrow, facing southwest.



Photograph 11. Class 5 burrow, rabbit scat visible. facing northwest.



Photograph 12. Class 5 burrow, whitewash visible, facing south.

Attachment 3

Floral and Faunal Compendium

Plant Species Observed within the Survey Area

Scientific Name	Common Name	Native or Introduced
Acamptopappus sphaerocephalus	rayless goldenhead	Native
Ambrosia dumosa	white bursage	Native
Ambrosia salsola	cheesebush	Native
Amsinckia sp.	fiddleneck	Native
Amsinckia tessellata	devil's lettuce	Native
Astragalus lentiginosus	freckled milk vetch	Native
Bromus rubens	red brome	Introduced
Bromus tectorum	cheatgrass	Introduced
Camissoniopsis sp.	suncup	Native
Castilleja exserta	purple owl's clover	Native
Croton setiger	dove weed	Native
Cryptantha sp.	popcorn flower	Native
Cylindropuntia echinocarpa	silver cholla	Native
Ephedra sp.	ephedra	Native
Eriastrum sp.	woollystars	Native
Ericameria nauseosa	rubber rabbitbrush	Native
Eriogonum gracillimum	rose and white buckwheat	Native
Erodium cicutarium	redstem stork's bill	Introduced
Euphorbia albomarginata	rattlesnake weed	Native
Eschscholzia californica	California poppy	Native
Grayia spinosa	spiny hop sage	Native
Hordeum murinum	wall barley	Introduced
Krascheninnikovia lanata	winterfat	Native
Larrea tridentata	creosote	Native
Lasthenia californica	California goldfields	Native
Linanthus parryae	sand blossom	Native
Loeseliastrum matthewsii	desert calico	Native
Lycium cooperi	peach thorn	Native
Malacothrix glabrata	desert dandelion	Native
Mirabilis laevis	desert wishbone bush	Native
Phacelia tanacetifolia	lacy phacelia	Native
Salvia columbariae	chia	Native
Schismus spp.	Mediterranean grass	Introduced
Sisymbrium sp.	hedge mustards	Introduced
Stephanomeria exigua	small wirelettuce	Native
Stipa hymenoides	Indian rice grass	Native
Stipa speciosa	desert needle grass	Native
Yucca brevifolia	Joshua tree	Native

Wildlife Species Observed in the Survey Area

Scientific Name	Common Name	Status	Native, Introduced, or Domesticated
Aspidoscelis tigris	western whiptail lizard	Common	Native
Campylorhynchus brunneicapillus	cactus Wren	Common	Native
Corvus corax	common raven	Common	Native
Crotalus scutulatus	Mohave rattlesnake	Common	Native
Dipodomys sp.	kangaroo rat	Common	Native
Gambelia wislizenii	long-nosed leopard lizard	Common	Native
Haemorhous mexicanus	house finch	Common	Native
Lanius ludovicianus	loggerhead shrike	CDFW Species of Special Concern	Native
Lepus californicus	black-tailed jackrabbit	Common	Native
Mimus polyglottos	northern mockingbird	Common	Native
Myiarchus cinerascens	ash-throated flycatcher	Common	Native
Spizella breweri	Brewer's sparrow	Common	Native
Troglodytes aedon	house wren	Common	Native
Uta stansburiana	side-blotched lizard	Common	Native
Zenaida macroura	mourning dove	Common	Native
Zonotrichia leucophrys	white-crowned sparrow	Common	Native

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Mojave Desert Tortoise Survey Report for the Proposed Euismod Project Willow Springs, Kern County, California Spring 2025

Prepared for:

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EXECUTIVE SUMMARY

On April 7-10, 2025 and May 6, 2025 personnel from Aardvark Biological Services, LLC conducted Mojave desert tortoise (*Gopherus agassizii*) (desert tortoise) pre-project protocol surveys for the Proposed Euismod Project in Willow Springs, Kern County, California. The surveys encompassed approximately 130 acres including the 120-acre project site. The purpose of the surveys for the Proposed Euismod Project were to:

- Determine if desert tortoises are present
- Estimate the number of desert tortoises, if present
- Provide information on habitat conditions

The protocol surveys were conducted utilizing the United States Fish and Wildlife Service small projects survey approach, which covered the entire footprint and an additional 100-foot buffer of the Proposed Euismod Project using 10-meter-wide belt transects. Results of the surveys are as follows:

- No desert tortoise individuals were observed.
- No desert tortoise sign (e.g., burrows, scat, carcasses) were observed.
- Habitat conditions observed were high levels of anthropogenic disturbance and degraded habitat. This was evidenced by the presence of common raven (*Corvus corax*) population, historic sheep grazing, trash, and minimal to no existing burrows, caves, and shelter sites; although there was perennial plant and annual plant communities present for above ground cover sites and forage for desert tortoises, and suitable substrates were present that are appropriate for burrow construction.

Consideration of the protocol survey results, literature review, and habitat conditions, lead to the determination that desert tortoises use and presence is not likely on the Proposed Euismod Project.

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PROJECT BACKGROUND

Project Location

The Proposed Euismod Project (Proposed Project) site comprises approximately 120 acres located in the west Mojave Desert, in the Willow Springs area, west of Rosamond, Kern County, California (Figure 1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The terrain is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. It lies north of the Southern California Edison (SCE) Whirlwind Substation, is bordered to the east by 170th Street West, to the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Proposed Project where it continues as a dirt road, and the northernmost end of the Proposed Project is bordered by an unnamed dirt road (Figures 1, 2). There are solar installations to the south and east of the Proposed Project and a wind farm to the northeast. The Proposed Euismod Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle) (Township 9N, Range 15W – a portion of the south half of Section 14).

Selected representative photographs for the Proposed Euismod Project are provided in Appendix A Photos (Photos 1-3).

Project Description

The Proposed Euismod Project would utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available such as from renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures connected to an onsite substation, that interconnects with the regional electric grid at the Whirlwind 220kV substation to the south of the Proposed Project.

Mojave Desert Tortoise Background

Mojave desert tortoises (*Gopherus agassizii*) (desert tortoise) are reptiles that are found in a range of habitats from rocky terrain, alluvial fans, washes, desert scrub, etc. throughout the Mojave and Colorado deserts of California, Nevada, Arizona, and Utah (USFWS 2022). They are a fossorial (burrowing) animal that digs new and modifies or utilizes existing, soil burrows, caves, and rock shelters for cover sites. They are known to be below ground in these cover sites more than 95% of the time. When above ground, shrubs such as creosote bushes (*Larrea tridentata*), are important resources for shade and cover. Desert tortoises primarily forage on annual wildflowers, but also forage on grasses, cacti, and other annuals. The active season for desert tortoises is considered April through May and September through October, when air temperatures are below 35°C (95°F) (Walde et al. 2003).



Figure 1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, California.

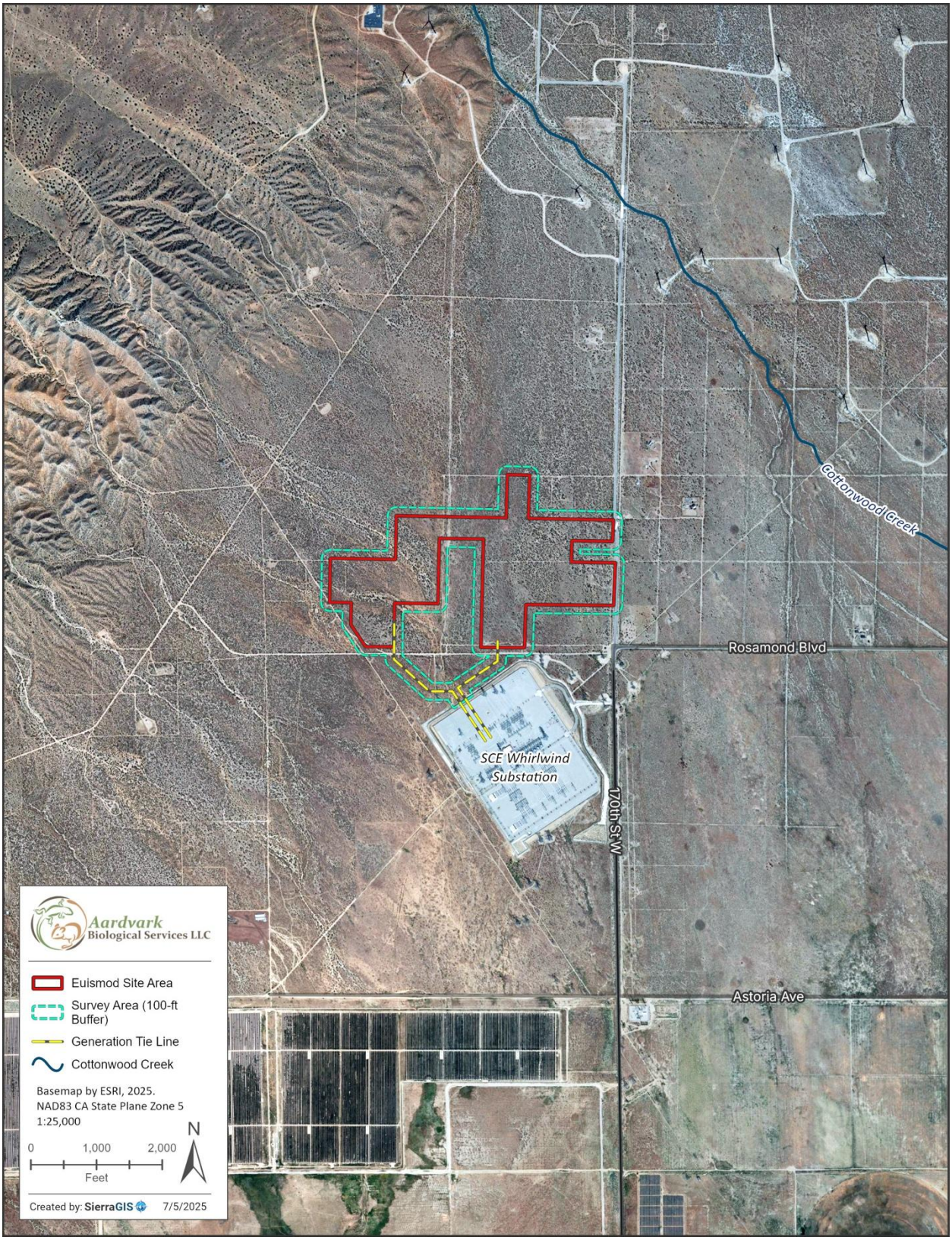


Figure 2. Proposed Euismod Project Location Map, Willow Springs, Kern County, California.

Mojave Desert Tortoise Background (continued)

The Mojave desert tortoise was uplisted from its 1989 threatened status to endangered in 2024, under the California Endangered Species Act. It was listed as threatened in 1990 under the Federal Endangered Species Act. The desert tortoise population decline is a result of multiple factors including but not limited to habitat fragmentation and degradation, vehicle strikes, disease, the pet trade, and an increase in subsidized predators (USFWS 2022). For example, common raven populations have increased due to anthropogenic food, water and shelter subsidies and are known to be large predators of hatchling and juvenile desert tortoises. Urbanization, development, and off-road vehicle recreation are also a few of the factors contributing to habitat fragmentation and degradation.

METHODS

Literature Review

Prior to conducting surveys, reported results from a 2024 desert tortoise survey report prepared for the Proposed Euismod Project (Rincon 2025), United States Fish and Wildlife (USFWS) critical habitat designation (USFWS 2025), and a records report generated using the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) (CDFW 2025) for a 5-mile buffer were reviewed.

Field Surveys

Mojave desert tortoise pre-project protocol surveys were conducted, using the small project survey methods from the *Preparing for any action that may occur within the range of the Mojave desert tortoise (Gopherus agassizii)* (United States Fish and Wildlife Service [USFWS] 2019). Data collection and categorization was based on the *Desert Tortoise (Mojave Population) Field Manual* (USFWS 2009).

On April 7-10, 2025 biologists Corey Chan and Crissy Slaughter conducted surveys using 10-meter-wide belt transects for the initial approximate 120-acre Proposed Euismod Project footprint and a 100-foot (ft) buffer. On May 6, 2025 biologist Corey Chan conducted an additional survey using the same methods to capture the approximate 10-acre increased southern footprint of the Proposed Euismod Project gen-tie line and associated 100-ft buffer. During these same time periods, biologists Corey Chan and Crissy Slaughter also conducted burrowing owl surveys onsite and into a 500-ft buffer (as feasible dependent on private property limitations) for the Proposed Euismod Project. These surveys in the larger buffer (100-ft to 500-ft) were conducted using 20-meter-wide belt transects.

RESULTS

Literature Review

The protocol desert tortoise surveys conducted in 2024 by Rincon Consultants, Inc. for the Proposed Euismod Project, reported one Class 3 burrow and no desert tortoise individuals or sign (Rincon 2025). A Class 3 burrow is defined as definitely desert tortoise, in deteriorated, including collapsed condition (USFWS 2009). Four Class 5 burrows, defined as possibly desert tortoise in deteriorated, including collapsed condition, were also reported (USFWS 2009).

The Proposed Euismod Project is not in USFWS-designated critical habitat for Mojave desert tortoises. The nearest critical habitat is situated approximately 32 miles east (USFWS 2025).

The CNDDB report for a 5-mile radius from the Proposed Euismod Project had observations from May 2010 of five Class 2, two Class 3, and one Class 4 burrows approximately 0.70 and 0.95 miles northwest of the Project (CNDDB 2025). Class 2 burrows are defined as definitely desert tortoise burrows in good condition, with no sign of recent use (USFWS 2009). Class 4 burrows are defined as possibly desert tortoise in good condition (USFWS 2009).

Field Surveys

No desert tortoise individuals were observed during the pre-project protocol surveys. No desert tortoise sign, including burrows, scat, carcasses, and other, were observed during the pre-project protocol surveys. The burrowing owl surveys in the extended 100-ft to 500-ft buffer area, also had no desert tortoise individuals or sign observed.

USFWS datasheets from the 2025 Mojave desert tortoise surveys are provided in Appendix B Datasheets. Table 1 shows the summary of weather data during the pre-project protocol surveys.

Habitat Conditions

The Proposed Euismod Project is composed of creosote bush scrub alliance with sporadic western Joshua trees (*Yucca brevifolia*). The creosote bushes are mature and irregularly spaced. Other common shrubs include goldenhead (*Acamptopappus sphaerocephalus var. hirtellus*), burro bush (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), rubber rabbitbrush (*Ericameria nauseosa*), wire-lettuce (*Stephanomeria pauciflora*), spiny hope-sage (*Grayia spinosa*), desert tomato (*Lycium andersonii*), box-thorn (*Lycium cooperi*), and Nevada ephedra (*Ephedra nevadensis*). The annual and perennial herb layer is open and sparsely populated with patchy bare soil present. This is likely due to the lack of precipitation prior to the survey season. Common native species include common goldfields (*Lasthenia gracilis*), vinegar

Table 1. Desert Tortoise Surveys Weather Data Summary

Date	Time (Start, End)	Ambient Temp (°F)	Wind (mph)	Cloud Cover (%)	Precipitation	Visibility
April 7, 2025	0900	60.7	2-3 E	10	none	unlimited
	1745	62.0	8-10 NW	10	none	unlimited
April 8, 2025	0800	60.7	9-15 W	10	none	unlimited
	1700	77.2	5-7 SW	0	none	unlimited
April 9, 2025	1200	83.9	1.9 E	1	none	unlimited
	1700	90.6	3-10 W	2	none	unlimited
April 10, 2025	0700	62.2	0-1 variable	0	none	unlimited
	1600	85.4	5-7 SW	0	none	unlimited
May 6, 2025	1000	68	7-10 SE	6	none	unlimited
	1900	67	10-12 W	5	none	unlimited

weed (*Lessingia glandulifera var.glandulifera*), and desert fiddleneck (*Amsinckia tessellata var. tessellata*) (Aardvark 2025).

Non-native, weedy annual herbs and grasses were common, especially in previously disturbed areas (powerlines) and adjacent to dirt roads. Non-native Mediterranean grasses (*Schismus arabicus* or *Schismus barbatus*), red brome (*Bromus rubens*), and cheatgrass (*Bromus tectorum*) were ubiquitous throughout, as was Russian-thistle (*Salsola tragus*) and red-stemmed filaree (*Erodium cicutarium*) (Aardvark 2025).

High levels of anthropogenic disturbance were present throughout the Proposed Euismod Project, which included trash and debris, historic sheep grazing (sheep scat), established dirt access roads, and off-road motorcycle trails. See Appendix A Photos (Photos 4-6).

Four cover sites of appropriate size for an adult desert tortoise, but none of which were desert tortoise burrows were observed on the Proposed Euismod Project and in the buffer. These cover sites were small mammal dens or digs, of desert kit fox (*Vulpes macrotis ssp. arsipus*), coyote (*Canis latrans*), or badger (*Taxidea taxus*). No caves or other shelter sites were observed. Common ravens were observed roosting, flying, and nesting on the Euismod Proposed Project and the adjacent areas.

DISCUSSION

Protocol surveys, literature review, and habitat conditions indicate that desert tortoises are not likely present on the Proposed Euismod Project.

The protocol surveys conducted in 2025 found no desert tortoise individuals or sign in the Proposed Euismod Project footprint or 100-ft buffer. This was the case even with surveys timed to be conducted in April and May during desert tortoise active season and in preferred temperature, below 95°F (Table 1). USFWS small project survey methods allow for surveys to be conducted at any time of year; however, conducting desert tortoise surveys during active season and during tortoise preferred temperatures increase the likelihood of finding individuals and sign (USFWS 2019). Additionally in spring 2025 burrowing owl surveys were conducted for a 500-ft buffer for the Proposed Euismod Project, and no desert tortoise sign or individuals were observed in the increased buffer area.

The literature review did not have strong evidence to indicate that desert tortoises are likely present on the Proposed Euismod Project. Although the protocol surveys conducted in 2024 (Rincon 2025) found one Class 3 burrow, this burrow was subsequently not found in the 2025 protocol survey and has been further investigated and determined to not be present in 2025. Additionally, the CNDDB records report showed records of burrows (five Class 2, two Class 3), but these records were >0.70 miles to the northwest, >14 years old, and no live individuals were reported.

Habitat conditions on the Proposed Euismod Project have a few characteristics that are indicators of moderate desert tortoise suitability, but there are also multiple strong indicators of low desert tortoise suitability. Perennial plant and annual plant communities are present to provide adequate cover and forage for desert tortoises, and there are suitable substrates present for burrow construction. However, the high levels of anthropogenic disturbance, the absence of shelters and caves, the few small mammal dens and digs available for adult desert tortoises to modify for burrows, and the common raven populations present, are strong indicators of the habitat degradation and overall low suitability of the Proposed Euismod Project for desert tortoises.

Inherent in conducting desert tortoise survey protocol surveys, there is a possibility of desert tortoises being present even with negative survey results (no sign and individuals observed), as they can be cryptic and individuals or sign could have been missed. Desert tortoises can move across areas between and during survey periods and avoid detection. Surveyed areas could also be on the edge of a home range or an area where desert tortoises disperse to, expand their range into, and/or travel through. This could result in individuals being present on the Proposed Euismod Project in

the future or a situation where they are so infrequently present that little or no sign is left on the landscape. Additionally, there was the Class 3 burrow reported from the 2024 surveys (Rincon 2025) that indicates historic desert tortoise usage of the area. However, these possible scenarios are of small likelihood. Consideration of all the findings from the protocol surveys, the literature review, and the overall habitat conditions lead to the determination that desert tortoises use and presence is not likely on the Proposed Euismod Project.

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APPENDIX A
PHOTOS



Photo 1. Representative view of the habitat on the Proposed Euismod Project.

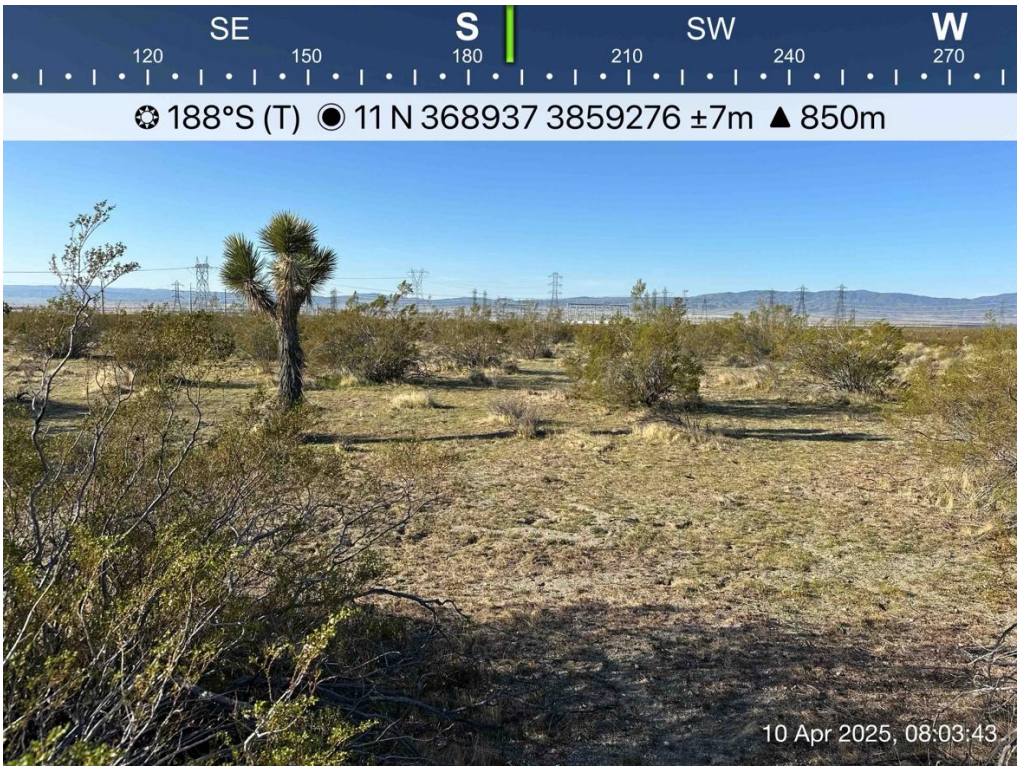


Photo 2. A second representative view of the habitat on the Proposed Euismod Project.



Photo 3. Additional representative view of the habitat on the Proposed Euismod Project.

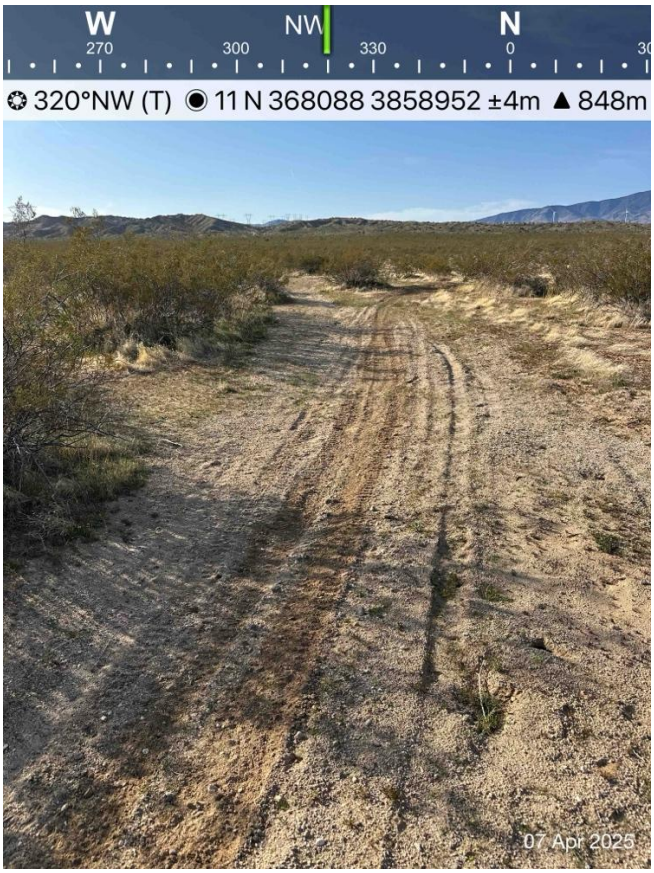


Photo 4. View of offroad trail on the Proposed Euismod Project.



Photo 5. Example of sheep scat found throughout the Proposed Euismod Project.



Photo 6. Example of trash found throughout the Proposed Euismod Project.

APPENDIX B
DATASHEETS

Version: October 8, 2019

Date of survey: 07 APR 2025 (day, month, year) Survey biologist(s): Corey Chan, Crissy Slaughter (name, email, and phone number)

Site description: Evsimod (project name and size, general location)

County: Kern Quad: Fairmont Butte Location: W. of Rosamond (UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: Site, buffer Transect #: — Transect length: 10m

GPS Start-point: 367753/3858971 (easting, northing, elevation in meters) Start time: 0900 am/pm

GPS End-point: 368240/3859360 (easting, northing, elevation in meters) End time: 1745 am/pm

Start Temp: 60.1F 15.94C End Temp: 62.0F/16.66C

Live Tortoises

Detection number	GPS location Easting	Northing	Time	Tortoise location (*in burrow*: all of tortoise beneath plane of burrow opening, or *not in burrow*)	Approx MCL ≥180 mm? (Yes, No or Unknown)	Existing tag # and color, if present
1	No DATA					
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	Northing	Type of sign (burrows, scats, carcass, etc)	Description and comments
1	No DATA			
2				
3				
4				
5				
6				
7				
8				

Version: October 8, 2019

Date of survey: 08 APR 2025 (day, month, year) Survey biologist(s): Corey Chan, Crissy Slaughter (name, email, and phone number)

Site description: Euismod (project name and size, general location)

County: Kern Quad: Fairmount Butte Location: W of Rosamond (UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: ~120 acre site and buffer Transect #: — Transect length: 10m

GPS Start-point: 368250 / 3859360 (easting, northing, elevation in meters) Start time: 0800 am/pm

GPS End-point: 368740 / 3859345 (easting, northing, elevation in meters) End time: 1700 am/pm

Start Temp: 60.7 °F 15.94 C End Temp: 77.2 °F/25.11 C

Live Tortoises

Detection number	GPS location Easting	GPS location Northing	Time	Tortoise location (*in burrow: all of tortoise beneath plane of burrow opening, or not in burrow*)	Approx MCL ≥180 mm? (Yes, No or Unknown)	Existing tag # and color, if present
1	NO DATA					
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	GPS location Northing	Type of sign (burrows, scats, carcass, etc)	Description and comments
1	NO DATA			
2				
3				
4				
5				
6				
7				
8				

Version: October 8, 2019

Date of survey: 09 APR 2025 (day, month, year) Survey biologist(s): Crissy Skughter (name, email, and phone number)

Site description: Eusimod (project name and size, general location)

County: Kern Quad: Fairmont Butte Location: W. of Rosamond (UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: ~~5Hc~~ ~120 acre Transect #: — Transect length: 10m

GPS Start-point: 368750 3859345 (easting, northing, elevation in meters) Start time: 1200 am/pm

GPS End-point: 368880 3859248 (easting, northing, elevation in meters) End time: 1700 am/pm

Start Temp: 28.8 °C ~~83.9 F~~ End Temp: 32.5 °C ~~90.5 F~~

Live Tortoises

Detection number	GPS location Easting	GPS location Northing	Time	Tortoise location (in burrow: all of tortoise beneath plane of burrow opening, or not in burrow)	Approx MCL ≥180 mm? (Yes, No or Unknown)	Existing tag # and color, if present
1						
2						
3						
4	NO DATA					
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	GPS location Northing	Type of sign (burrows, scats, carcass, etc)	Description and comments
1				
2				
3				
4	NO DATA			
5				
6				
7				
8				

Version: October 8, 2019

Date of survey: 10 APR 2025 (day, month, year) Survey biologist(s): Crissy Skrughter, Cory Chan (name, email, and phone number)

Site description: Euismod (project name and size, general location)

County: Kern Quad: Fairmount Butte Location: W. of Rosamond/Willow Springs (UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: _____ Transect #: — Transect length: 10m

GPS Start-point: 368980 3859248 (easting, northing, elevation in meters) Start time: 0700 am/pm

GPS End-point: completed site and buffer (100 ft) (easting, northing, elevation in meters) End time: ~~1600~~ 1600 am/pm

Start Temp: 16.78 °C End Temp: 29.67 °C 85.4 F

62.2 F

Live Tortoises

Detection number	GPS location Easting	GPS location Northing	Time	Tortoise location (*in burrow*: all of tortoise beneath plane of burrow opening, or *not in burrow*)	Approx MCL ≥180 mm? (*Yes, No or Unknown*)	Existing tag # and color, if present
1	no data					
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	GPS location Northing	Type of sign (*burrows, scats, carcass, etc*)	Description and comments
1	no data			
2				
3				
4				
5				
6				
7				
8				

Note: Visited Class 3 burrow from Rincon 2024 Survey @ 34.86375, -118.445095
Burrow doesnot exist.

Version: October 8, 2019

Date of survey: 06 MAY 2025 (day, month, year) Survey biologist(s): Corey Chan (name, email, and phone number)

Site description: Euismod (add-on area to S of initial footprint) (project name and size, general location)

County: Kern Quad: Fairmount Butte Location: W. of Rosamond (UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: ~10 acres Transect #: — Transect length: 10m

GPS Start-point: 368388 3858624 (easting, northing, elevation in meters) Start time: 1000 am/pm

GPS End-point: Completed area + buffer (easting, northing, elevation in meters) End time: 1900 am/pm

Start Temp: 20 °C 68 F End Temp: 19.44 °C/67F

Live Tortoises

Detection number	GPS location Easting	GPS location Northing	Time	Tortoise location (*in burrow*: all of tortoise beneath plane of burrow opening, or *not in burrow*)	Approx MCL ≥180 mm? (*Yes, No or Unknown*)	Existing tag # and color, if present
1	no data					
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	GPS location Northing	Type of sign (*burrows, scats, carcass, etc*)	Description and comments
1	no data			
2				
3				
4				
5				
6				
7				
8				

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Appendix C6
Swainson's Hawk Nesting Habitat Assessment Report

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Rincon Consultants, Inc.
250 East 1st Street, Suite 1400
Los Angeles, California 90012
213-788-4842

January 28, 2025
Project Number: 23-14888

Joe Stenger, P.G.
Program Director, Renewables Delivery Team
TRC Solutions
2666 Rodman Drive
Los Osos, California 93402
Via email: jstenger@trccompanies.com

Subject: Nesting Habitat Assessment for Swainson's Hawk, Euismod BESS Project, Kern County, California

Dear Mr. Stenger:

Rincon Consultants, Inc. (Rincon) completed this report for the Euismod Battery Energy Storage System (BESS) Project (project). The project involves development of a BESS site and associated access roads in unincorporated Kern County, California. This report was prepared to document the results of the nesting habitat assessment for Swainson's hawk (SWHA; *Buteo swainsoni*) within one mile of the proposed project.

Project Location and Description

The project is generally located in the southern portion of unincorporated Kern County on the eastern side of the Tehachapi Mountains (Attachment 1; Figure 1). The Project Land Holdings include approximately 120 acres of undeveloped land located approximately 16 miles west of the unincorporated community of Rosamond and 20 miles northwest of the city of Lancaster.

The project proposes to develop a BESS site and associated access roads on the Project Land Holdings in eastern Kern County, California (Attachment 1; Figure 2). The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Southern California Edison Whirlwind 220 kilovolt (kV) substation located approximately 0.3 mile to the southeast. Batteries associated with the project would be contained on site in outdoor enclosures. Access roads would connect the site to the nearest public road at 170th Street.

Methods

This section describes methods for literature review/desktop evaluation and assessment of habitat for SWHA in the Project Land Holdings and a one-mile buffer (Survey Area). The purpose of this survey was to assess the potential for SWHA nesting habitat within the Survey Area and record any nests if found. Data collected in the field were interpreted into maps depicting vegetation communities, potential nest site locations, and nest observations.

Background and Literature Review

Prior to visiting the Survey Area, recent aerial photography of the site (Google Earth Pro 2024) was reviewed to establish familiarity with the Survey Area and surrounding natural landscape. The California Natural Diversity Database (CNDDB; California Department of Fish and Wildlife [CDFW]

2024) was searched for records of SWHA within the Survey Area and the surrounding USGS 7.5-minute topographic quadrangles: *Fairmont Butte, Liebre Twins, Tylerhorse Canyon, Willow Springs, Neenach School, Little Buttes, Burnt Peak, Lake Hughes,* and *Del Sur, California*. In addition, Rincon conducted a literature review to identify the potential locations of nesting SWHA in the region, including the following resources as well as environmental documents for other renewable energy projects in the area.

- Swainson's Hawk Nesting Population in the Antelope Valley of the Western Mojave Desert, California (Bloom et al. 2023), and
- Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California (California Energy Commission [CEC] and California Department of Fish and Game 2010).

Field Survey

Rincon biologists Jose Lopez and Stephanie Tam conducted the nesting habitat assessment on April 9 and April 11, 2024. Potential nesting sites, including suitable structures and trees, were assessed for active or inactive SWHA or other raptor nests during the survey. Biologists also noted the vegetation type to provide a qualitative summary of nesting potential within the Survey Area. The biologists took representative site photographs (Attachment 2), documented the predominant vegetation communities present and recorded plant and wildlife species observed. On April 9, survey conditions from 1300 to 1700 included sunny skies, temperatures ranging from approximately 64 degrees Fahrenheit (°F) to 72°F, and 4 to 10 mile-per-hour (mph) winds. On April 11, survey conditions from 1100 to 1300 included sunny skies, temperatures ranging from approximately 72°F to 75°F, and 5 to 10 mph winds. The surveys were conducted by walking the Project Land Holdings and by driving on public paved and dirt roads within the Survey Area. Vehicular surveys within one mile of the Project Land Holdings were conducted to identify potentially suitable SWHA nesting habitat (trees and manmade structures such as power poles and transmission lines). The survey followed the methodology outlined in *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California* (CEC and California Department of Fish and Game 2010). These surveys were conducted with binoculars and spotting scopes to aid in bird or nest detection, where accessible. No private properties were accessed in the Survey Area except those previously authorized.

Species Background

The SWHA is a stout-bodied and broad-winged hawk with a wingspan of approximately 362 to 406 millimeters (mm) for males and 375 to 427 mm for females (Friedmann 1950). SWHAs exhibit polymorphism that is based on the color of the underparts; the variation is categorized from light to dark, and rufous (Palmer 1988). In California, darker coloration is more common among females than males (Woodbridge 1987). Both the male and female participate in nest initiation and nesting pairs will defend nesting territory while they hunt communally. Nesting occurs March through August. SWHA are breeding season migrants to California (Bechard et al. 2020).

SWHAs forage in open grasslands, sparse shrublands, and agricultural areas and have a diet that includes mammals, birds, reptiles, and invertebrates (Bechard et al. 2020). The hawks often hunt while perched on elevated surfaces or on the ground, and sometimes course low over fields during and after harvests. This species has adapted to agriculture in its breeding and overwintering range. For nesting, particularly in central California, SWHA build stick nests in a variety of native (i.e. oaks, cottonwoods, Joshua trees) and non-native (i.e. eucalyptus, ornamental conifers) tree species. They are typically seen near the edges of riparian habitat and in solitary trees located by farms, roads, or

residential areas, while a small number of nests have been reported on structures such as transmission towers (Bechard et al. 2020).

Ongoing SWHA breeding season surveys conducted from 1979 to 2022 in the Antelope Valley documented their predilection to nest in non-native or unidentified deciduous trees (86 percent) compared to western Joshua trees (*Yucca brevifolia*; 14 percent), which SWHA were historically known to use for nesting in this region (Bloom et al. 2023). Recent agricultural development in the Antelope Valley has shifted the species' preferred foraging habitats to alfalfa and other crops that support a higher abundance of prey species (e.g., gophers and voles) than surrounding native desert habitat. While foraging still occurs to some extent in native habitats—evidenced by the presence of low numbers of desert horned lizard (*Phrynosoma platyrhinos*) and western whiptail (*Aspidoscelis tigris*) remains in one or two nests—most nest sites are now located in trees near agricultural fields (Bloom et al. 2023).

SWHAs breed throughout western North America and winter mostly in Argentina and sometimes in western Mexico (Bloom et al. 2023). In California, breeding populations of SWHAs were once abundant and are now nearly extirpated within coastal southern California, central Coast Ranges, and Mojave Desert due to urban development. In California, their current breeding territories are concentrated in the Antelope, Central, and San Joaquin valleys.

The SWHA is federally protected by the Migratory Bird Treaty Act (MBTA) in the United States and is listed by the California Fish and Game Commission as threatened pursuant to the California Endangered Species Act (CDFW 2024).

Existing Setting

This section provides information on existing site conditions, including land use, topography, soils, and vegetation communities and land cover types.

Land Use

The Survey Area is located in the western Mojave Desert in the shadow of the Tehachapi Mountains to the northwest. There is an existing wind farm to the northeast. South of the Survey Area, patches of native desert community intermingle with solar panels, agriculture, residential areas, and disturbed (ruderal) land (TRC Solutions 2023). The Survey Area and surrounding vicinity are mostly undeveloped, with dominant land cover consisting of creosote bush (*Larrea tridentata*) scrub. Signs of historical grazing activity are evident from old cow manure observed throughout the Survey Area, indicating previous land use. Various well-traveled routes intersect the vegetation communities in and around the Survey Area including unpaved roads supporting local utility facilities, off-highway vehicle (OHV) trails, and hiking trails.

Topography and Soils

The Survey Area is located on alluvial slopes on the south side of the Tehachapi Mountain range with elevations in the Project Land Holdings ranging from approximately 2,730 to 2,810 feet above mean sea level (amsl). The ground surface slopes gently to moderately in a northwest to southeast direction. Topographic features visible from the Project Land Holdings and within the Survey Area include the hillsides to the northwest, with elevations ranging from 2,980 to 3,300 feet amsl.

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey delineates twelve soil map units within the Survey Area, consisting mostly of Cajon loamy sand and Hesperia fine sandy loam. Cajon loamy sand consists of alluvium derived from granite,

with 2 to 9 percent slopes. Hesperia fine sandy loam also consists of alluvium derived from granite, with 2 to 5 percent slopes (USDA NRCS 2024).

Vegetation and Land Covers

Based on the desktop review and mapping, and field-verification during the survey, vegetation communities in the Survey Area generally consists of creosote bush scrub with pockets of cheesebush (*Ambrosia salsola*)/sweetbush *(Bebbia juncea*) scrub in the Project Land Holdings; California juniper (*Juniperus californica*) woodland in the hills to the northwest; Joshua tree (*Yucca brevifolia*) woodland in the north and west portions of the Survey Area; shadscale (*Atriplex confertifolia*) scrub in the southeast; and (Attachment 1, Figure 3).

The Survey Area also contains two land covers: agricultural and developed land (Attachment 1, Figure 3). A barley plantation, was observed in the southwestern portion of the Survey Area. Aerial imagery also shows various agricultural fields in the surrounding area (Google Earth Pro 2024). Developed land consists of the Southern California Edison Whirlwind substation to the south of the Project Land Holdings. Multiple powerlines cross the Study Area, including an H-frame transmission line on the west side and a lattice tower transmission line on the east side, both running diagonally to the Project Land Holdings(Attachment 1, Figure 4). Additionally, a monopole tower transmission line runs from south to north along the center of the Project Land Holdings and Survey Area. This transmission line is not shown in Attachment 1, Figure 4 due to unavailable spatial data.

Results

This section discusses the habitat assessment findings and further evaluates the potential for SWHA to occur in the Survey Area.

Historical and Known Occurrences

The CNDDB search yielded 21 documented occurrences of SWHA within a 9-quadrangle search around the Survey Area (CDFW 2024). Most of these observations are located approximately 8 to 12 miles east of the Project Land Holdings, near agricultural fields, with nests noted as occurring in introduced or ornamental tree species such as Aleppo pine (*Pinus halepensis*), tamarisk (*Tamarix sp.*), and Chinese elm (*Ulmus parvifolia*), although a few nests were observed in native trees such as Arizona cypress (*Cupressus arizonica*), willows (*Salix sp.*), cottonwoods (*Populus sp.*), and Joshua trees. Of the 21 records, only two observations were recorded within five miles of the Project Land Holdings. The closest record, located about 2 miles southeast of the Project Land Holdings, details active nests observed on Chinese elm trees from 2016 to 2020. The second record dates to 2021 of an active nest found on a Joshua tree located about 4.5 miles northeast of the Project Land Holdings.

Project Land Holdings

Western Joshua trees were sporadically distributed in the Project Land Holdings; no other trees were observed. . No SWHA, other raptor, or any large nest was detected on any of the trees or structures identified in the Project Land Holdings. One inactive nest was observed just outside the westernmost boundary, at the top of an H-frame transmission structure (Attachment 1, Figure 4). Biologists could not confirm whether the nest belonged to a raptor or a common raven (*Corvus corax*).

Survey Area (1-mile buffer)

Western Joshua trees and California juniper (*Juniperus californica*) were the only tree species observed within the Survey Area. Joshua tree woodlands were predominantly concentrated along the northern and western boundaries of the Survey Area, extending towards the base of the mountains

and covering an area of approximately 531 acres, based on review of aerial imagery and windshield survey of that area. Scattered western Joshua trees were observed outside of the Joshua tree woodlands but none were observed south of Rosamond Boulevard within the Survey Area. The California Juniper woodland was confined to the mountainous terrain on the western and northwestern perimeters of the Survey Area. Multiple transmission lines crossed into the Survey Area including single pole, H-frame, and lattice transmission towers. Three active common raven nests, and one inactive large nest were observed along the lattice transmission towers that extend to the northeast of the Whirlwind substation (Attachment 1, Figure 4). It could not be determined conclusively if the inactive nest was a common raven or a raptor nest. No SHWA or other raptor nest was detected in any of the surveyed trees within the Survey Area. No SWHA individuals were observed within the Survey Area; however, one perched hawk was observed on a transmission tower in the eastern portion of the Survey Area (Attachment 1, Figure 4). The hawk was observed from a distance and could not be identified to species.

Conclusion

The Survey Area contains suitable nesting habitat that was historically important for SWHA, such as Joshua tree woodlands and individual western Joshua trees. Recent CNDDB records of nests in Joshua trees demonstrate that SWHA continue to use these trees. However, in the Antelope Valley, there is a preference for non-native or ornamental trees growing near agricultural fields. The few CNDDB observations recorded within 5 miles of the Project Land Holdings, combined with the lack of SWHA activity throughout the Survey Area during the survey suggests that the Project Land Holdings and Survey Area are not likely supporting an abundance of nesting SWHA; however, it is not impossible for the species to nest in this area in the future given the presence of historically used nesting habitat (western Joshua trees). The presence of large nests along lattice and H-frame towers in the Survey Area indicate that these towers could host SWHA nests; however, Bechard et al. (2020) reports that there is a low potential for SWHA to nest on the transmission towers.

It is recommended that a pre-construction survey for SWHA be conducted before the commencement of construction activities. This survey should be carried out during the breeding season (typically March through September) to identify any active nests within and surrounding the Project Land Holdings. Depending on the survey results, coordination with agency biologists may be necessary to establish appropriate mitigation measures for the project prior to and during construction. These measures could include timing restrictions, buffer zones, or other protective actions.

Thank you for the opportunity to support the Euismod BESS project. Please do not hesitate to contact Lisa Zumwalde (lzumwalde@rinconconsultants.com) at 562-822-9776 for questions about the contents of this report.

Sincerely,
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Attachments

Attachment 1 Figures
Attachment 2 Representative Site Photographs
Attachment 3 Floral and Faunal Compendium

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Attachment 1

Figures

Figure 1 Regional Vicinity

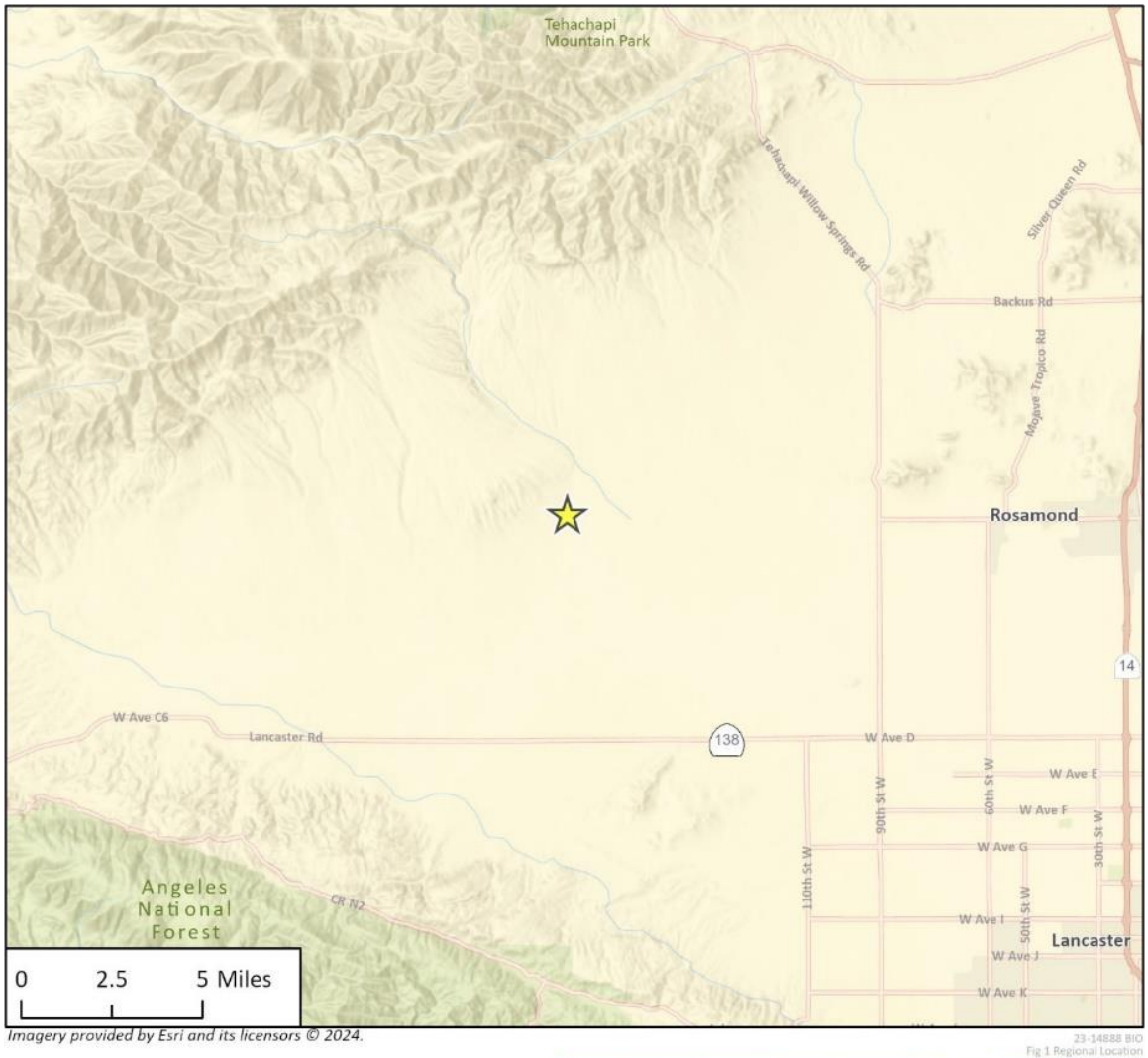


Figure 2 Survey Area

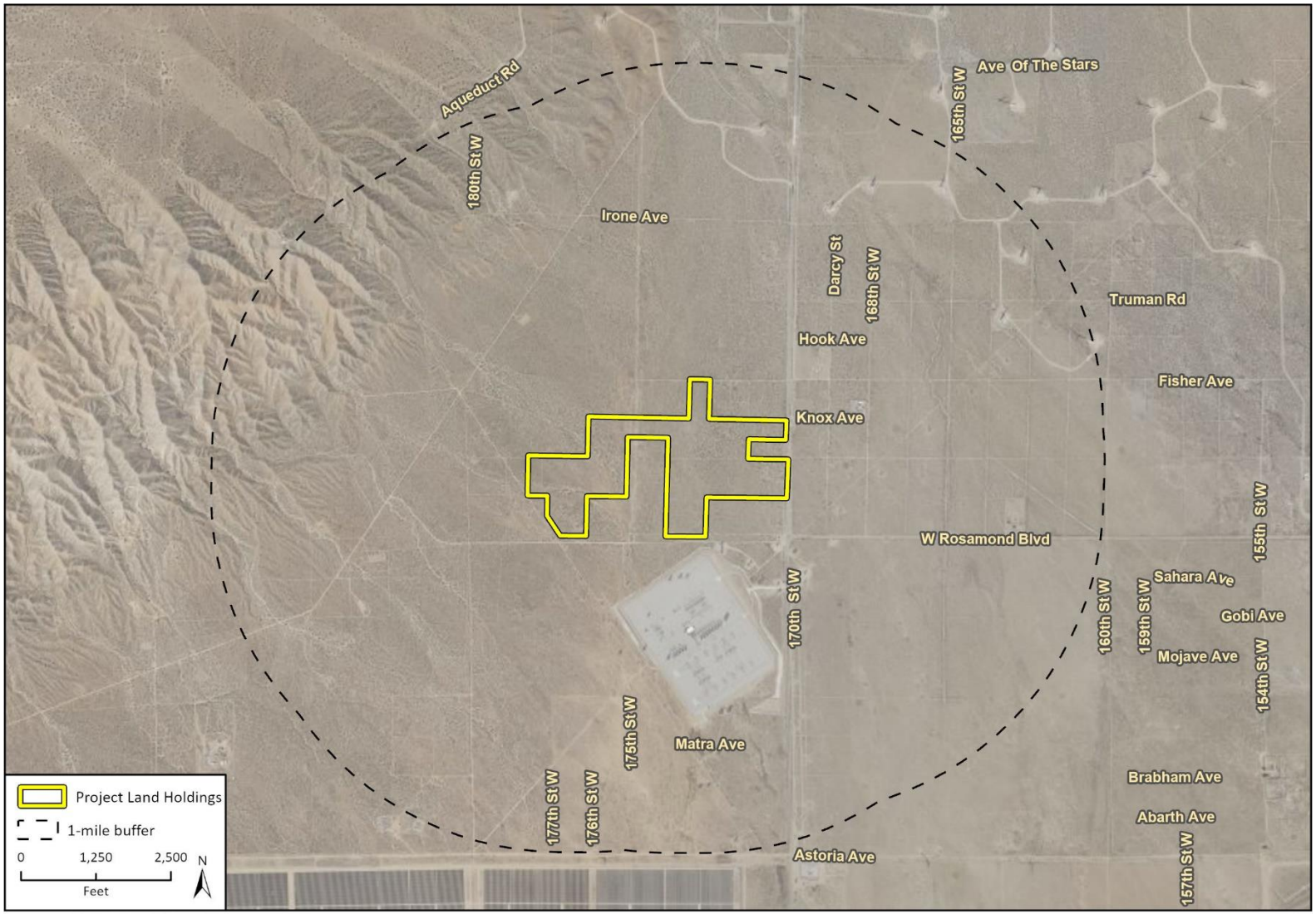
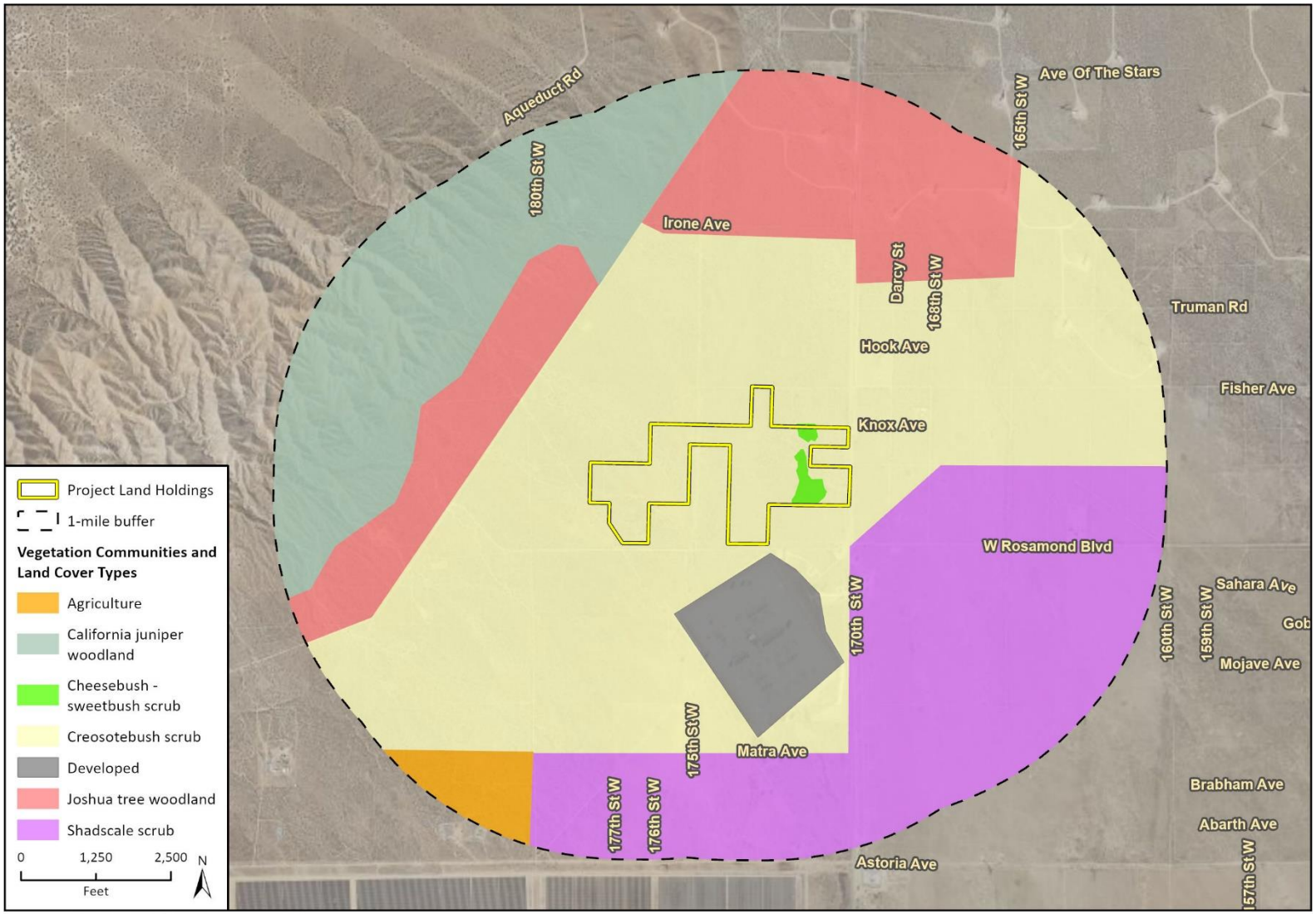


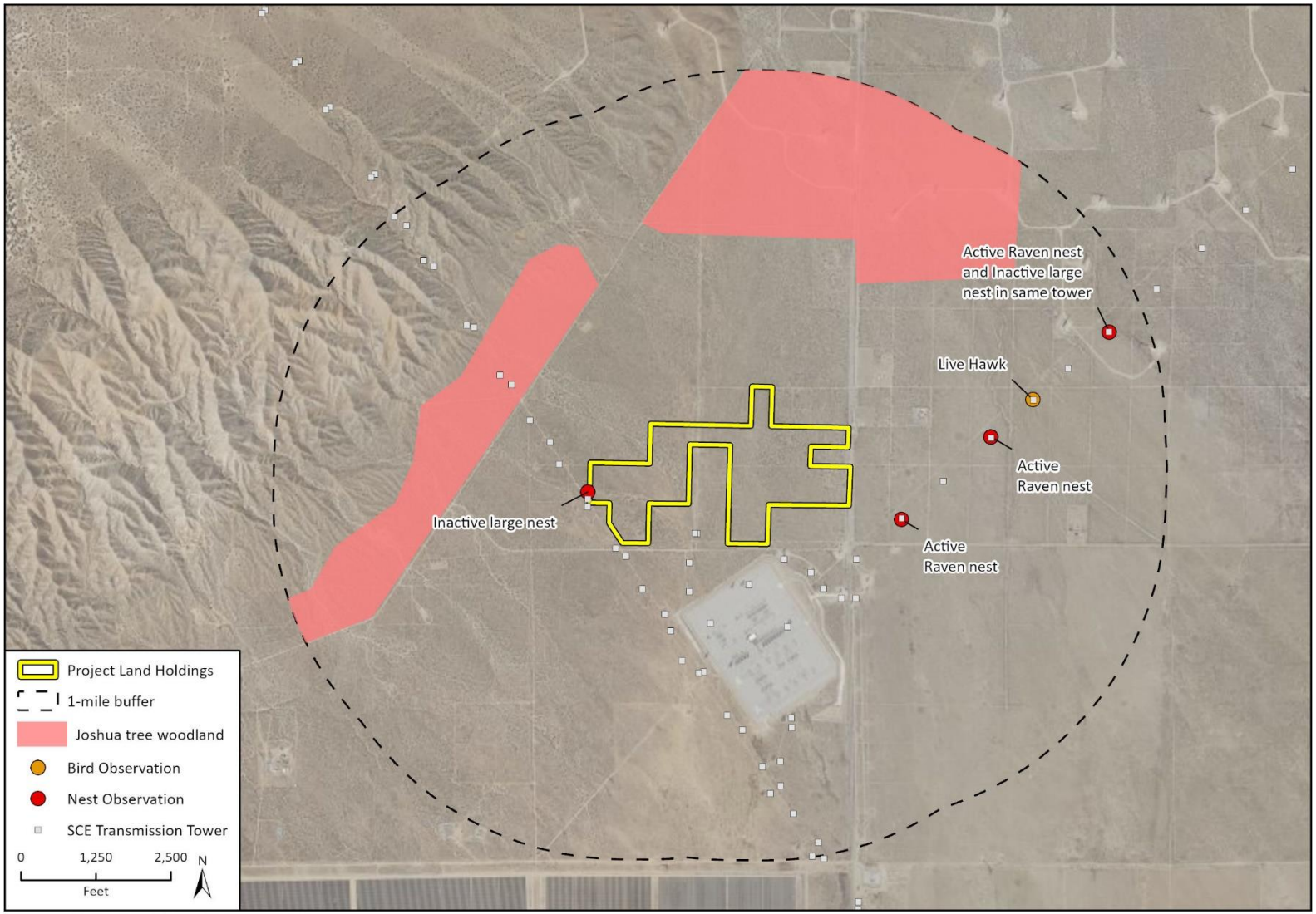
Figure 3 Vegetation Communities and Land Cover Types



Imagery provided by Microsoft Bing and its licensors © 2025.

23-14888 BIO
Fig 3 Veg Communities

Figure 4 Potential SWHA Nesting Habitat and Bird/Nest Observations



Attachment 2

Representative Site Photographs



Photograph 1. View of the Project Land Holdings from the western end, facing south.



Photograph 2. View of the Project Land Holdings from the eastern end, facing west.



Photograph 3. View of the Survey Area from the northern end, facing south.



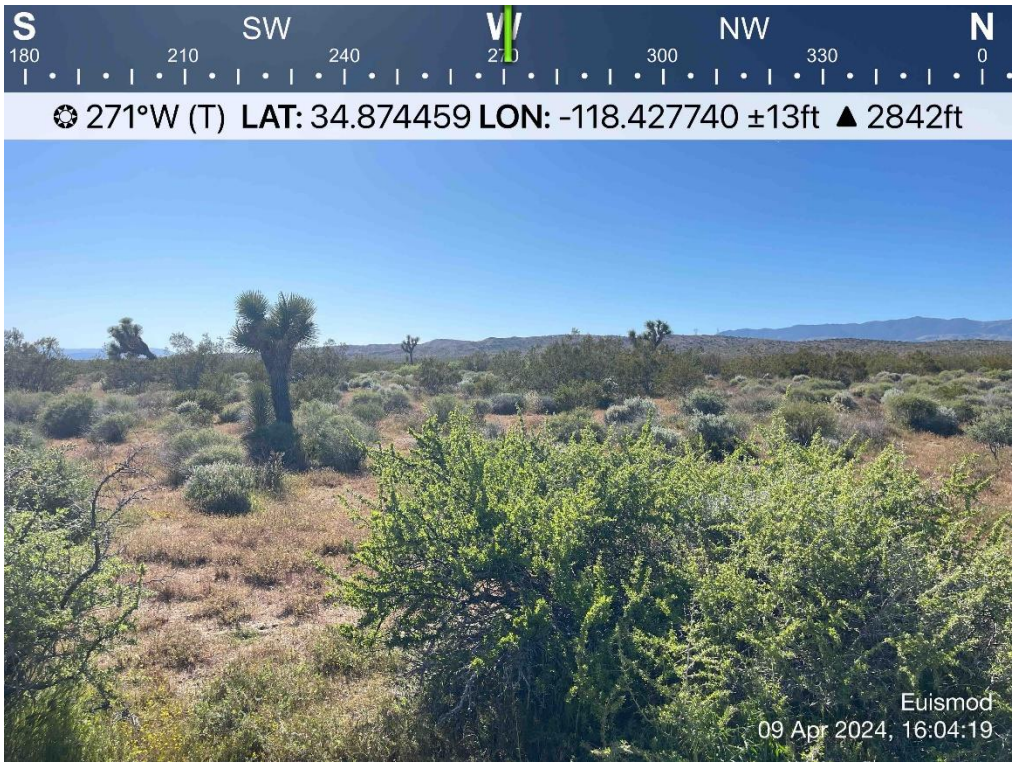
Photograph 4. View of the Survey Area and lattice towers from the eastern end, facing southwest.



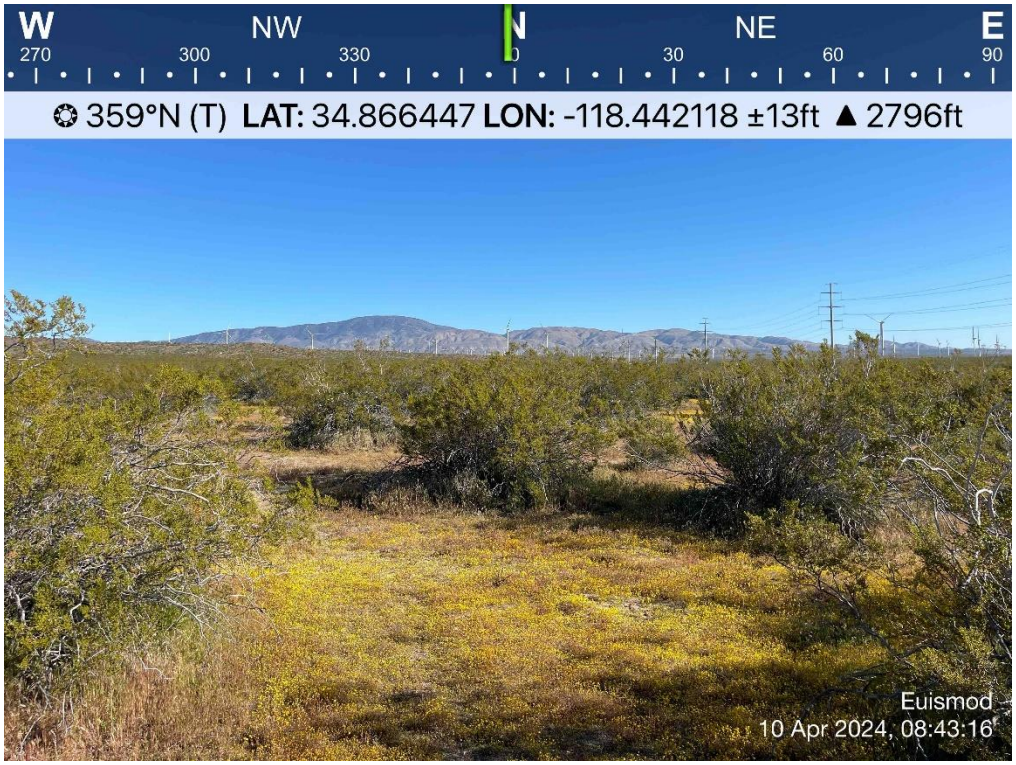
Photograph 5. View of the Survey Area, transmission lines, and substation from southern end, facing northwest.



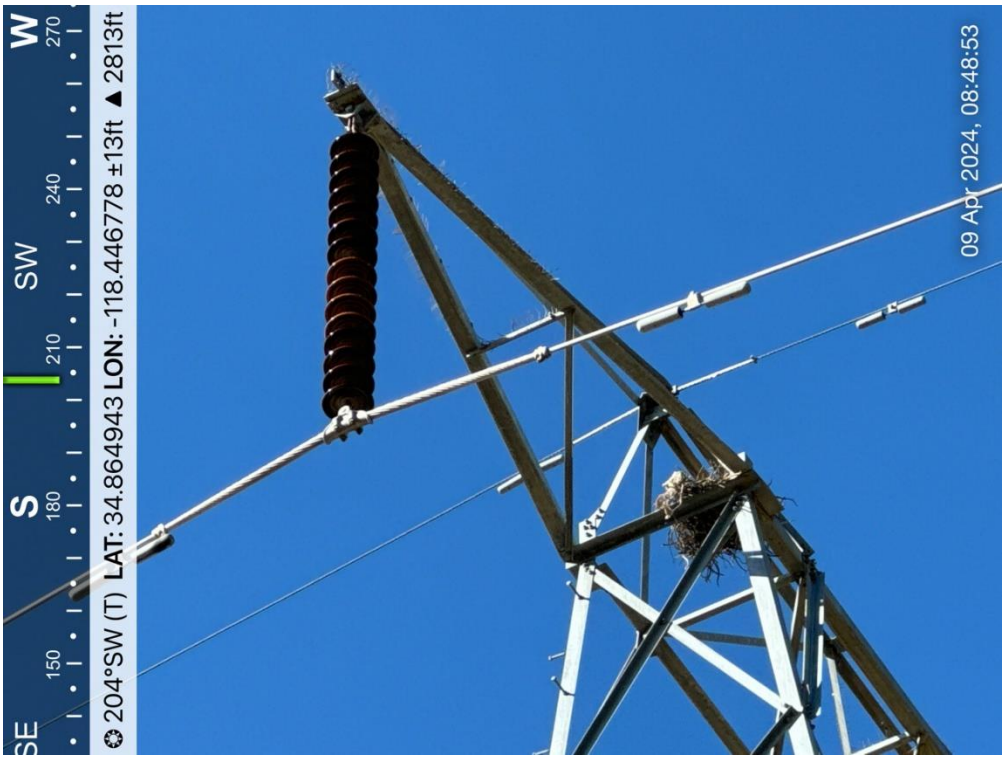
Photograph 6. View of the Survey Area and hills from the western end, facing northwest.



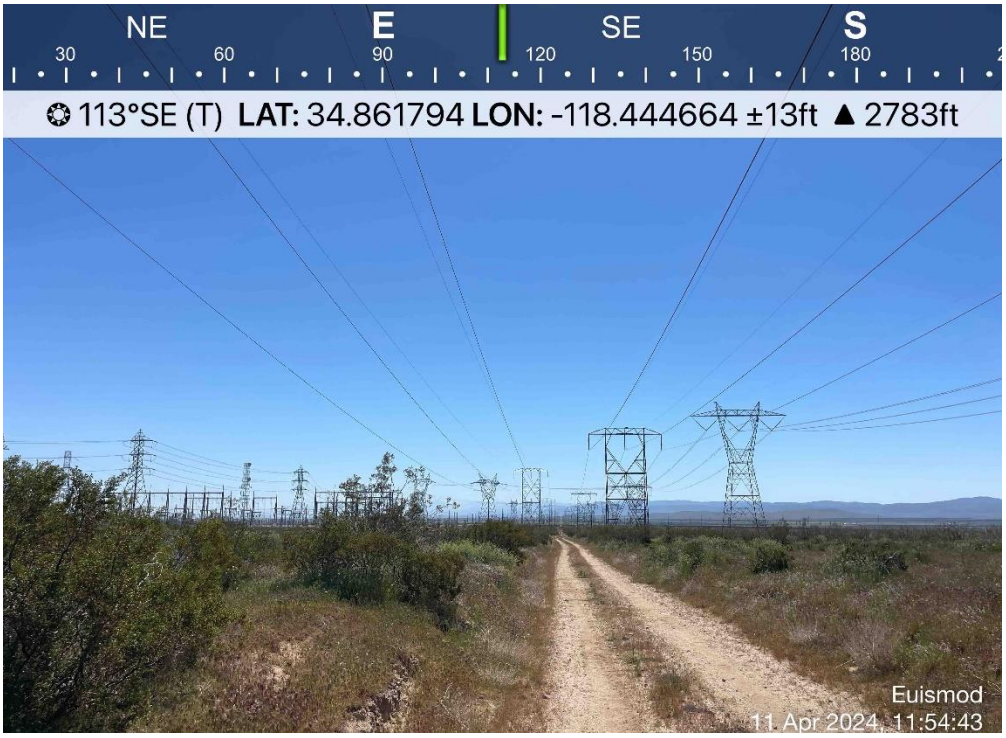
Photograph 7. View of western Joshua trees, northeastern section of Survey Area, facing west.



Photograph 8. View of creosote bush scrub, from near the center of the Project Land Holdings, facing north.



Photograph 9. View of a large inactive nest on an H-frame tower located west of the project site, facing south.



Photograph 10. View of the substation and transmission lines, representing the highest concentration of structures in the Survey Area. No existing raptors nests were observed on these structures.

Attachment 3

Floral and Faunal Compendium

Plant Species Observed within the Survey Area

Scientific Name	Common Name	Native or Introduced
Acamptopappus sphaerocephalus	rayless goldenhead	Native
Ambrosia dumosa	white bursage	Native
Ambrosia salsola	cheesebush	Native
Amsinckia sp.	fiddleneck	Native
Amsinckia tessellata	devil's lettuce	Native
Astragalus lentiginosus	freckled milk vetch	Native
Bromus rubens	red brome	Introduced
Bromus tectorum	cheatgrass	Introduced
Camissoniopsis sp.	suncup	Native
Castilleja exserta	purple owl's clover	Native
Croton setiger	dove weed	Native
Cryptantha sp.	popcorn flower	Native
Cylindropuntia echinocarpa	silver cholla	Native
Ephedra sp.	ephedra	Native
Eriastrum sp.	woollystars	Native
Ericameria nauseosa	rubber rabbitbrush	Native
Eriogonum gracillimum	rose and white buckwheat	Native
Erodium cicutarium	redstem stork's bill	Introduced
Euphorbia albomarginata	rattlesnake weed	Native
Eschscholzia californica	California poppy	Native
Grayia spinosa	spiny hop sage	Native
Hordeum murinum	wall barley	Introduced
Krascheninnikovia lanata	winterfat	Native
Larrea tridentata	creosote	Native
Lasthenia californica	California goldfields	Native
Linanthus parryae	sand blossom	Native
Loeseliastrum matthewsii	desert calico	Native
Lycium cooperi	peach thorn	Native
Malacothrix glabrata	desert dandelion	Native
Mirabilis laevis	desert wishbone bush	Native
Phacelia tanacetifolia	lacy phacelia	Native
Salvia columbariae	chia	Native
Schismus spp.	Mediterranean grass	Introduced
Sisymbrium sp.	hedge mustards	Introduced
Stephanomeria exigua	small wirelettuce	Native
Stipa hymenoides	Indian rice grass	Native
Stipa speciosa	desert needle grass	Native
Yucca brevifolia	Joshua tree	Native

Wildlife Species Observed with the Survey Area

Scientific Name	Common Name	Status	Native, Introduced, or Domesticated
Aspidoscelis tigris	western whiptail lizard	Common	Native
Campylorhynchus brunneicapillus	cactus wren	Common	Native
Corvus corax	common raven	Common	Native
Crotalus scutulatus	Mohave rattlesnake	Common	Native
Dipodomys sp.	kangaroo rat	Common	Native
Gambelia wislizenii	long-nosed leopard lizard	Common	Native
Haemorhous mexicanus	house finch	Common	Native
Lanius ludovicianus	loggerhead shrike	CDFW Species of Special Concern	Native
Lepus californicus	black-tailed jackrabbit	Common	Native
Mimus polyglottos	northern mockingbird	Common	Native
Myiarchus cinerascens	ash-throated flycatcher	Common	Native
Spizella breweri	Brewer's sparrow	Common	Native
Troglodytes aedon	house wren	Common	Native
Uta stansburiana	side-blotched lizard	Common	Native
Zenaida macroura	mourning dove	Common	Native
Zonotrichia leucophrys	white-crowned sparrow	Common	Native

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Appendix C7
2025 Protocol Swainson's Hawk Survey Report

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Swainson's Hawk Survey Report for the Proposed Euismod Project Willow Springs, Kern County, California Spring 2025

Prepared for:

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EXECUTIVE SUMMARY

In Spring of 2025, a Swainson's hawk (*Buteo swainsoni*) literature review and protocol surveys were conducted for the approximate 120-acre Proposed Euismod Project and a 5-mile buffer, in Willow Springs, Kern County, California. Results indicate that Swainson's hawks are not nesting on the Proposed Euismod Project or within the 5-mile buffer in 2025.

Literature review results had occurrence records of Swainson's hawk nests at two locations outside the Proposed Euismod Project (Proposed Project) footprint. One location was 2.0 miles southeast (in 2016, 2018, and 2020) and the other was 4.3 miles northeast (in 2021) of the Proposed Project (CNDDB 2025). The Swainson's hawk protocol surveys were conducted over ten field days between March 19, 2025 and June 23, 2025 using methods from the California Energy Commission and California Department of Fish and Game (CEC 2010). There were observations of Swainson's hawk adults during four of the survey days in the 5-mile buffer, but no breeding behavior, nests or chicks were observed. This is with the exception of one observation of a Swainson's hawk nest with one chick and two nearby adults that was made outside of the 5-mile buffer, approximately 5.5 miles from the Proposed Project.

Although no Swainson's hawk nests or breeding behavior were observed during the 2025 surveys, there is potential for the species to nest on the Proposed Project and in the 5-mile buffer due to the existing potential nesting habitat, the live individuals observed during surveys, and past nest occurrence records. This is further supported by Swainson's hawks known high site fidelity (CEC 2010).

If taking into account only the Proposed Euismod Project footprint, the potential for Swainson's hawk nesting is lower than in the 5-mile buffer. This is due to the Proposed Project having lower foraging habitat, and reflected in the absence of observations and occurrences in the 2024 and 2025 surveys and past occurrence records on the Proposed Project.

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INTRODUCTION

Project Location

The Proposed Euismod Project (Proposed Project) comprises approximately 120 acres located in the west Mojave Desert, in the Willow Springs area, west of Rosamond, Kern County, California (Figure 1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The terrain is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. It lies north of the Southern California Edison (SCE) Whirlwind Substation and is bordered to the east by 170th Street West. To the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Proposed Project where it continues as a dirt road. The northernmost end of the Proposed Project is bordered by an unnamed dirt road (Figures 1, 2). There are solar installations to the south and east of the Proposed Project and a wind energy generation project to the northeast. The Proposed Euismod Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle) (Township 9N, Range 15W – a portion of the south half of Section 14).

Selected representative photographs for the Proposed Euismod Project are provided in Appendix A Photos (Photos 1-3).

Project Description

The Proposed Euismod Project would utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available, such as from renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures connected to an onsite substation, that interconnects with the regional electric grid at the Whirlwind 220kV substation to the south of the Proposed Project.

Swainson's Hawk Background

Swainson's hawks (*Buteo swainsoni*) are medium sized raptors in the Accipitridae family. Adult birds typically have a characteristic dark head and breast band contrasting with their light-colored belly, and underside of their wings having lighter-colored coverts compared to their dark primaries and secondaries (flight feathers). California populations of Swainson's hawks breed from late March to mid-August in the state, and then will migrate and overwinter in South America, primarily in Argentina, in late August to October.

Historically, Swainson's hawks were found in open habitats such as grasslands and prairies where they nest and primarily forage on mammals and insects. As land use has changed since the early 1900s, large portions of native landscape have been converted to agriculture, renewable energy, and



Figure 1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, California.

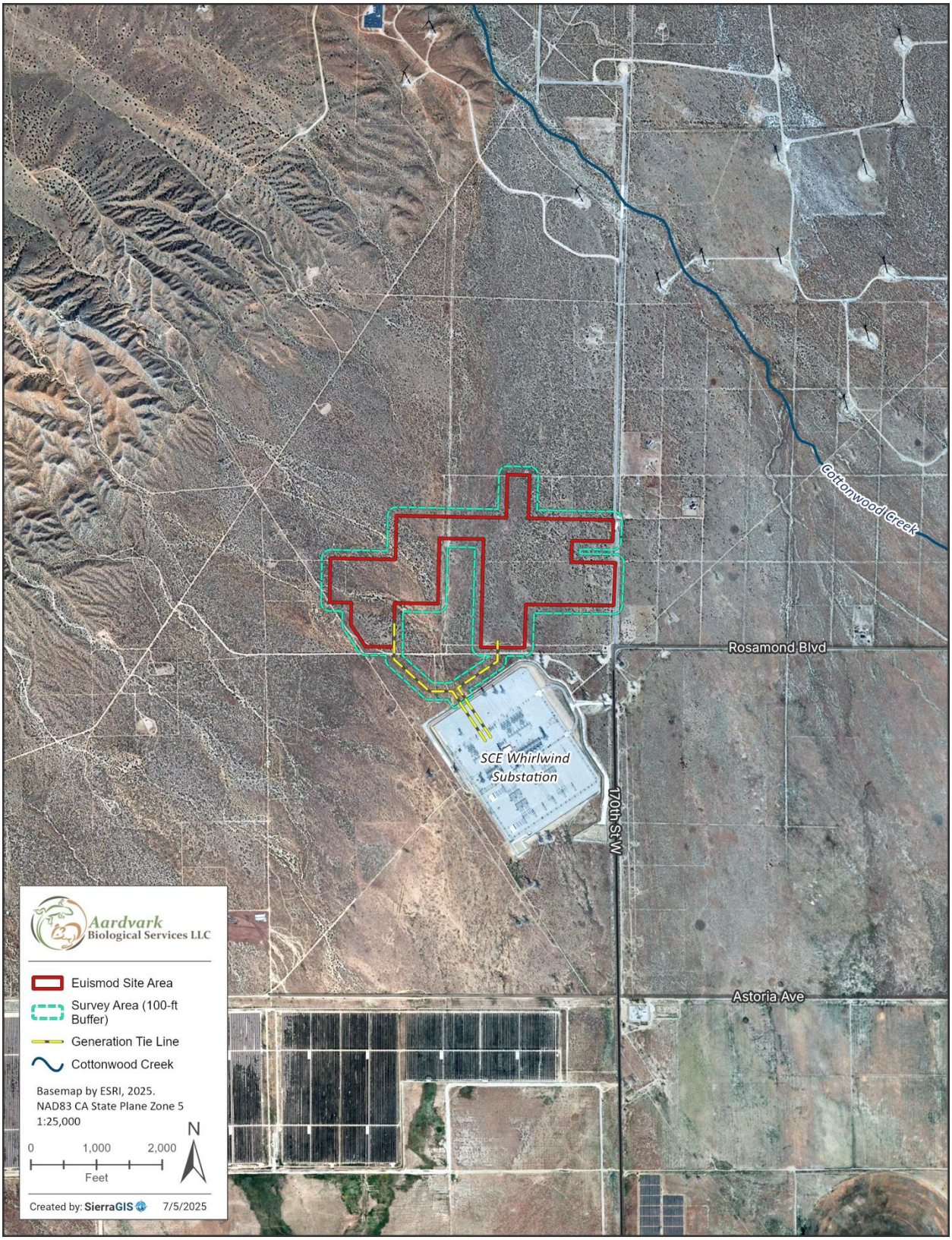


Figure 2. Proposed Euismod Project Location Map, Willow Springs, Kern County, California.

Swainson's Hawk Background (continued)

other urban development. This has resulted to Swainson's hawks often being now found adjacent to the open habitats of agricultural fields and pastures where they utilize solitary trees, hedgerows of trees, and agriculture infrastructure for perching and foraging. They have been shown to have a strong preference for open habitat or habitat with less cover for foraging (Bechard 1982, Bloom 2023). In the Antelope Valley, Swainson's hawk diet has to be shown to be dominated mainly by rodents, with some birds, reptiles and amphibians. Botta's pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*), and California ground squirrel (*Otospermophilus beecheyi*) are the most common prey (Bloom 2023).

In the Antelope Valley, Swainson's hawk nesting sites have also changed with native landscape being converted, from historically mainly western Joshua trees (*Yucca brevifolia*) to both western Joshua trees (Joshua trees) and non-native trees such as elm (*Ulmus* spp.), Aleppo pine (*Pinus halepensis*), and tamarisk (*Tamarix* spp.) trees (Bloom 2023). Transmission towers and power poles are rarely used as nesting sites (Bechard 2020). Swainson's hawks are known to have high site fidelity and to re-use nests from previous years (CEC 2010).

Swainson's hawks were listed as threatened under the California Endangered Species Act in 1983 and were designated a Federal Species of Concern in 2002. It is also protected under the Federal Migratory Bird Treaty Act of 1918. Loss of native landscape for foraging and breeding grounds are the main recognized impacts to the population (Bloom 2023).

METHODS

Literature Review

Prior to conducting surveys, a 2024 Swainson's hawk nesting habitat assessment report prepared for the Proposed Euismod Project (Rincon 2025) and a records report generated using the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) (CDFW 2025) for a 5-mile buffer were reviewed.

Field Surveys

In Spring 2025, biologists Corey Chan and Crissy Slaughter conducted Swainson's hawk protocol surveys using methods from the California Energy Commission and California Department of Fish and Game (now California Department of Fish and Wildlife) document *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California.* (CEC 2010). The protocol surveys were completed over 10 days and 4 Survey Periods (Survey Period I: March 19; Survey Period II: April 11, 16, 27; Survey Period III: May 12, 19, 20; Survey Period IV: June 17, 20, 23) for the approximate 120-acre Proposed Euismod Project and a 5-mile buffer.

The following table is a brief summary of the Swainson's hawk protocol survey timing and survey focus as correlated with expected bird behaviors (CEC 2010):

Table 1. Swainson's Hawk Protocol Surveys Timing

Survey Period	Number of Surveys	Timing	Swainson's Hawk (SWHA) Behavior & Main Survey Focus
I	1	January - March 31	Prior to SWHA adult arrival Familiarization with area Locate SWHA potential nesting locations Identify competing species nests
II	3	April 1 - April 30	Most SWHA adults arrived from wintering grounds Identify SWHA territories, courtship Look for SWHA breeding behavior, nest building
III	3	May 1- May 30	SWHA adults on nests - laying, incubating Monitor SWHA nest sites, identify nest locations Look especially for SWHA males returning to nest
IV	3	June 1 - July 15	SWHA young fledging SWHA young active and visible SWHA adults near nest, at nest

The Swainson's hawk protocol surveys were conducted focusing on observations and vocalizations. Driving surveys were primarily used, with walking surveys employed to more thoroughly examine areas or trees when driving was not as effective. Surveyors had high quality binoculars and spotting

scopes. All observations of Swainson's hawks and their behaviors as well as active nests of great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis),* and common raven (*Corvus corax*) were recorded.

RESULTS

Literature Review

The Swainson's hawk nesting habitat assessment prepared for the Proposed Euismod Project (Rincon 2025), had no observations of Swainson's hawks on the Proposed Project and 1-mile buffer during 2024 field surveys. The assessment concluded that the Proposed Project is not likely supporting an abundance of nesting Swainson's hawks, but recommended Swainson's hawk pre-construction surveys prior to construction due to existing nesting habitat of western Joshua trees and transmission towers.

The CNDDB report for a 5-mile radius (5-mile buffer) from the Proposed Euismod Project had Swainson's hawk occurrences approximately 2.0 miles southeast and 4.3 miles northeast of the Proposed Project (CNDDB 2025). The record to the southeast has had nests observed in 2016, 2018, and 2020. The 2020 nest was in a Chinese elm (*Ulmus* spp.) adjacent to agricultural fields and two adults and two chicks were observed. The record to the northeast was observed in 2021 and documented one adult on the nest likely incubating. The nest was in a western Joshua tree in Joshua tree woodland interspersed with dirt access roads and solar facilities in the vicinity.

Field Surveys

During Survey Period I of the Swainson's hawk protocol surveys, Joshua tree woodland, creosote bush (*Larrea tridentata*) scrub with sparse Joshua tree woodland, and non-native single or hedgerows of tree(s) were areas identified as potential nesting habitat within the Proposed Euismod Project and 5-mile buffer (Appendix A, Photos 4-6). The Proposed Euismod Project footprint is composed of creosote bush scrub alliance with sporadic western Joshua trees present (Aardvark 2025b). The creosote bush scrub is mature and commonly 8-10 feet tall. These sporadic western Joshua trees are potential nesting habitat. The networks of lattice transmission towers, H-frame structures, and distribution poles throughout the entire area were also identified as potential nesting habitat, though known to be rarely used (Bechard 2020).

During Swainson's hawk protocol surveys for the Proposed Euismod Project and the 5-mile buffer, there were observations of adults in Survey Period II and IV, but no nests or breeding behavior was observed. The Swainson's hawk adults in Survey Period II were observed in two general areas, 4.2 miles south of the Proposed Project near a Joshua tree woodland and 2.0 miles southeast of the Proposed Project in a hedgerow of Chinese elms. The location at the Chinese elms is adjacent to agricultural fields and in the same region as the CNDDB nest from 2016, 2018, and 2020. In Survey Period IV, two adult Swainson's hawks were observed in this same area. Leg bands were observed on at least one individual Swainson's hawk in both Survey Period II and IV, but were only partially readable.

In Survey Period IV, on June 23, 2025, two adult Swainson's hawks and one nest with one chick were observed approximately 5.5 miles southwest from the Proposed Euismod Project, in a hedgerow of Aleppo pines. Active competing nest species observations over the protocol survey period included five great horned owl, two red-tailed hawk, as well as eleven common raven nests. Unknown status or inactive nests were not recorded.

In Spring of 2025, 10-meter-belt transect desert tortoise and western burrowing owl surveys were also conducted for the Proposed Euismod Project (Aardvark 2025a, Aardvark 2025c) and no Swainson's hawk individuals were observed. During these surveys, individuals and sign of known common prey species of Swainson's hawk (Botta's pocket gopher, California vole, and California ground squirrel) were not observed on the Proposed Project. Black-tailed jackrabbit (*Lepus californicus*), western whiptail (*Cnemidophorus tigris*), and white-tailed antelope ground squirrel (*Ammospermophilus leucurus*) were observed during these surveys; however, these species are known to be the less common prey species of Swainson's hawks (Bloom 2023).

A summary of the Swainson's hawk protocol survey results including timing, weather conditions, and Swainson's hawk observations are in Table 2. Locations of the Swainson's hawks and the active nests of competing species are in Figure 3. Photographs during protocol surveys of Swainson's hawks and competing species active nests are in Appendix A (Photos 7-19).

Table 2. Swainson's Hawks Protocol Survey Results Summary

	Date	Time	Ambient Temp (°F)	Wind (mph)	Cloud Cover (%)	Precipitation	Visibility	Swainson's Hawk Observations Summary (mi=miles, site=Proposed Euismod Project, ~=approximate)
Survey Period I	3/19/25	0700	36	1-2 variable	0	none	unlimited	no adults, nests, chicks observed
		1200	61	5-7 SE	5	none	unlimited	
		1700	65	2-3 SE	20	none	unlimited	
Survey Period II	4/11/25	0800	62	3-6 W	10	none	unlimited	1 adult ~4.2 mi south of site flying in Joshua tree woodland no breeding behavior, nests, chicks observed
		1200	77	5-10 W	30	none	unlimited	
		1630	72	8-12 NW	65	none	unlimited	
	4/16/25	0700	52	8-10 SW	25	none	unlimited	1 adult ~4.2 mi south of site flying 1 adult ~2.0 mi southeast of site perched, flying (near CNDDB 2016, 2018, 2020 nest) no breeding behavior, nests, chicks observed
		1200	70.6	10-12 S	5	none	unlimited	
		1630	66.1	3-10 W	2	none	unlimited	
	4/27/25	0800	49	8-13 SW	60	none	unlimited	1 adult ~2.0 mi southeast of site perched, flying (near CNDDB 2016, 2018, 2020 nest) no breeding behavior, nests, chicks observed
		1200	58	10-14 W	65	none	unlimited	
		1630	60	11-15 W	65	none	unlimited	
Survey Period III	5/12/25	0800	64	5-9 NW	5	none	unlimited	no adults, nests, chicks observed
		1200	78.8	13-17 NW	25	none	unlimited	
		1600	75.7	20-27 S	35	none	unlimited	
	5/19/25	0800	69	8-13 SW	20	none	unlimited	no adults, nests, chicks observed
		1200	75	12-18 W	20	none	unlimited	
		1630	81	12-15 W	25	none	unlimited	
	5/20/25	0800	71	10-14 S	25	none	unlimited	no adults, nests, chicks observed
		1200	77	12-18 SW	25	none	unlimited	
		1630	83	10-15 W	25	none	unlimited	

CNDDB – California Natural Diversity Database

Table 2. Swainson's Hawk Protocol Survey Results Summary (continued)

	Date	Time	Ambient Temp (°F)	Wind (mph)	Cloud Cover (%)	Precipitation	Visibility	Swainson's Hawk Observations Summary (mi=miles, site=Proposed Euismod Project, ~=approximate)
Survey Period IV	6/17/25	0630	67	3-4 W	0	none	unlimited	2 adults in same vicinity ~2.0 mi southeast of site perched, flying (near CNDDB 2016, 2018, 2020 nest) no breeding behavior, nests, chicks observed
		1300	95	3-4 NW	0	none	unlimited	
		1600	96	10-12 W	0	none	unlimited	
	6/22/25	0800	68	5-8 SW	15	none	unlimited	no adults, nests, chicks observed
		1200	79	5-10 W	20	none	unlimited	
		1630	81	7-12 S	15	none	unlimited	
	6/23/25	0800	67	5-8 S	15	none	unlimited	2 adults ~5.5 mi southwest of site flushed from hedgerow of Aleppo pines Nest with 1 chick ~5.5 mi southwest of site in Aleppo pine no other adults, nests, chicks observed (none observed within 5 mi)
		1200	80	8-12 SW	20	none	unlimited	
		1630	92	10-15 W	20	none	unlimited	

CNDDB – California Natural Diversity Database

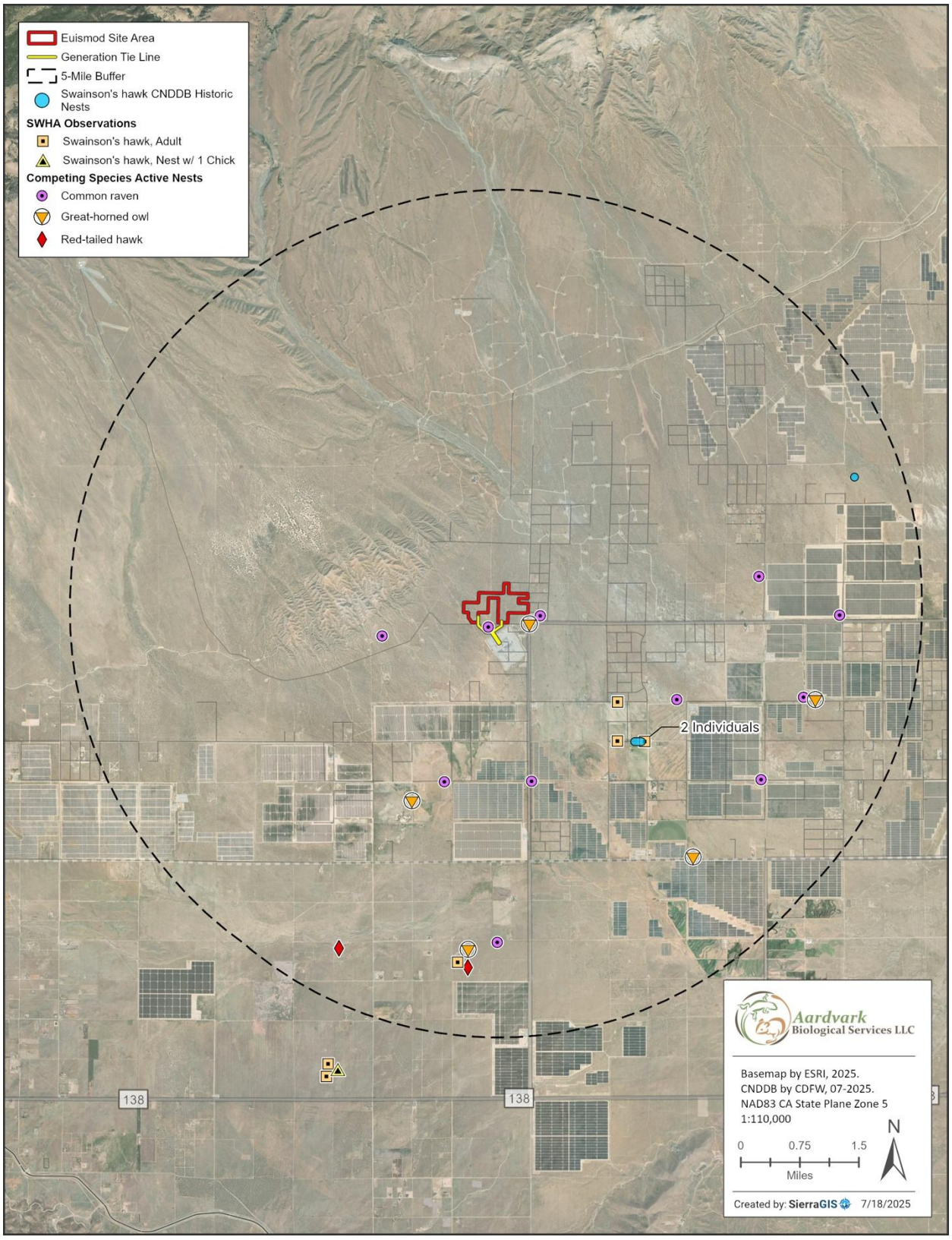


Figure 3. Proposed Euismod Project Locations of Swainson's Hawk and Competing Species Nests, 2025 Swainson's Hawk Protocol Surveys

DISCUSSION

Protocol Swainson's hawk surveys were conducted for the Proposed Euismod Project and 5-mile buffer in the spring of 2025; however, no Swainson's hawk nests or breeding behavior were observed despite the presence of potential nesting habitat (i.e., Joshua trees, ornamental trees, and transmission towers). These results indicate that Swainson's hawks are not nesting on the Proposed Euismod Project or within the 5-mile buffer in 2025.

Potential nesting habitat on the Proposed Euismod Project consisted of sporadic western Joshua trees located in creosote bush scrub and transmission towers. This habitat is not considered high quality foraging grounds for Swainson's hawk (Babcock 1995, Bechard 1982). This is due to the increased cover of the mature, commonly 8-10 feet tall creosote bush shrubs and the lack of common Swainson's hawk prey species observed (Botta's pocket gopher, California vole, and California ground squirrel) (Bloom 2023) during 2025 desert tortoise and western burrowing owl surveys conducted for the Proposed Euismod Project (Aardvark 2025a, Aardvark 2025c). Potential nesting habitat in the 5-mile buffer included Joshua tree woodland, non-native single or hedgerows of trees, transmission towers, and power poles.

The 2025 literature review had CNDDB occurrence records of Swainson's hawks within 5 miles of the Proposed Project (CNDDB 2025); however, no Swainson's hawks were observed on the Proposed Project or a 1-mile buffer during a nesting habitat assessment conducted in 2024 (Rincon 2025). The closest CNDDB occurrence records were of adults, chicks, and a nest from 2016, 2018, and 2020 in a Chinese elm located approximately 2.0 miles southeast of the Proposed Project (CNDDB 2025). The other record was of a Swainson's hawk adult on a nest in a Joshua tree located approximately 4.3 miles northeast of the Proposed Project in 2021 (CNDDB 2025).

Swainson's hawk adult individuals were observed within the 5-mile buffer during Survey Period II and IV. Observations during Survey Period II were of single individuals flying or perched; however, no nests or breeding behavior was observed. Knowing Swainson's hawk have a high site fidelity, the most notable observation was of two adults in the same area as the CNDDB nest occurrence record 2.0 miles southeast of the Proposed Project, observed during Survey Period IV. This past nest occurrence was in an elm tree, of which a hedgerow of these elm trees were still present during the 2025 surveys. This hedgerow is also located adjacent to agricultural fields that are considered high quality foraging habitat for Swainson's hawk (Babcock 1995, Bechard 1982). These Swainson's hawk individuals were likely migrating, non-reproductive, or foraging. They also could have been nesting at locations outside the 5-mile buffer, such as the pair and nest observed approximately 5.5 miles southwest of the Proposed Project in Survey Period IV.

Although no Swainson's hawk nests or breeding behavior were observed during the 2025 surveys, there is potential for the species to nest on the Proposed Project and in the 5-mile buffer due to the existing potential nesting habitat, the live individuals observed during surveys, and occurrence records of past nests within 5 miles of the Proposed Project. This is further supported by Swainson's hawks high site fidelity.

If taking into account only the Proposed Euismod Project footprint, the potential for Swainson's hawk nesting is lower than within the 5-mile buffer. This is due to the Proposed Project foraging habitat being of lower quality (as described earlier in the discussion), and reflected in the absence of observations and occurrences in the 2024 and 2025 surveys and past CNDDB records on the Proposed Project.

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APPENDIX A
PHOTOS



Photo 1. Representative view of the habitat on the Proposed Euismod Project.

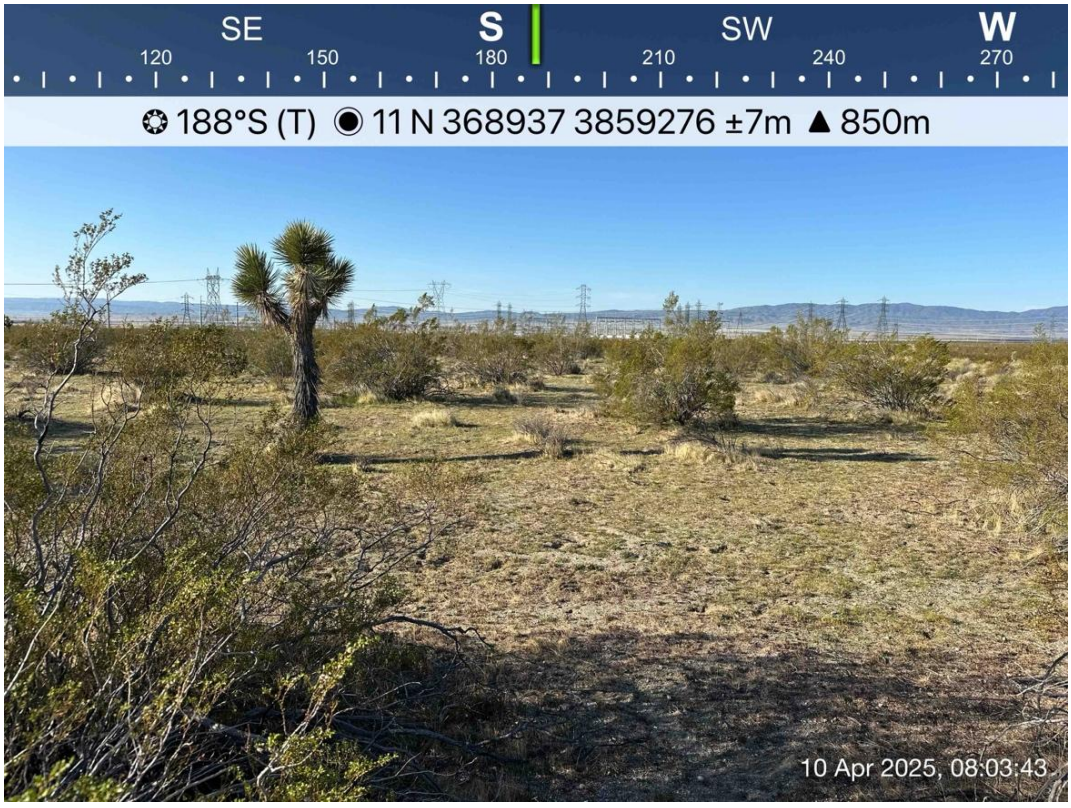


Photo 2. A second representative view of the habitat on the Proposed Euismod Project.



Photo 3. Additional representative view of the habitat on the Proposed Euismod Project.

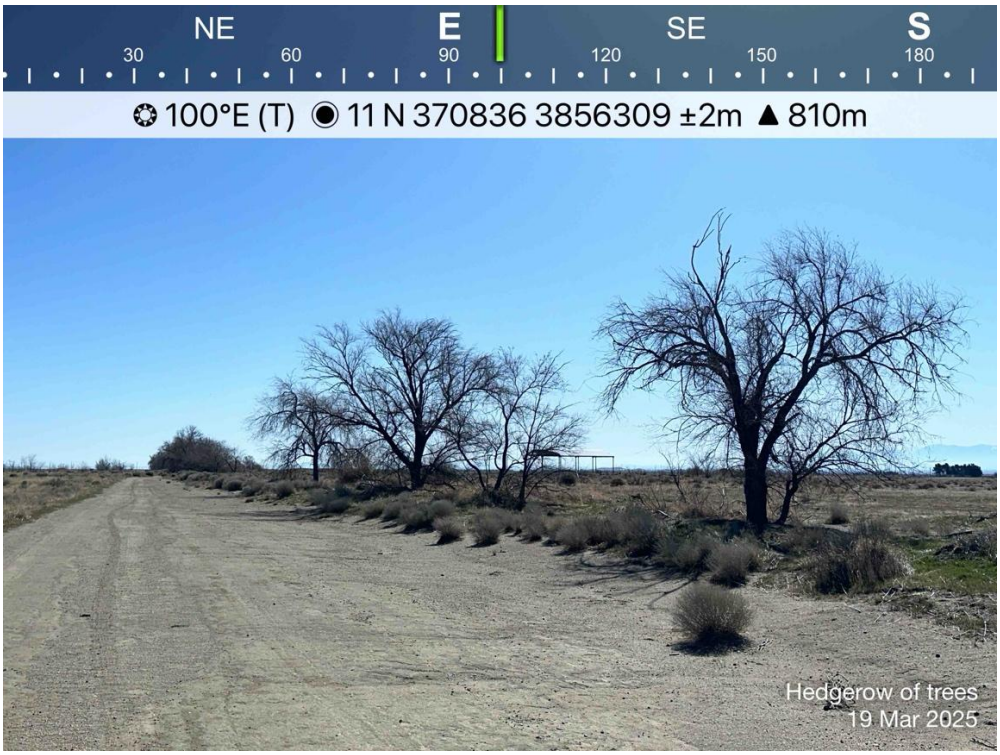


Photo 4. Potential Swainson's hawk foraging and nesting habitat of hedgerow of non-native trees adjacent to agricultural fields in 5-mile buffer of the Proposed Euismod Project.



Photo 5. Potential Swainson's hawk nesting habitat of hedgerow of pine trees surrounding a residential compound in 5-mile buffer of the Proposed Euismod Project on 3/19/2025.



Photo 6. Potential Swainson's hawk nesting habitat of hedgerow of tamarisk trees adjacent to dirt access road and solar farm in 5-mile buffer of the Proposed Euismod Project on 3/19/2025.

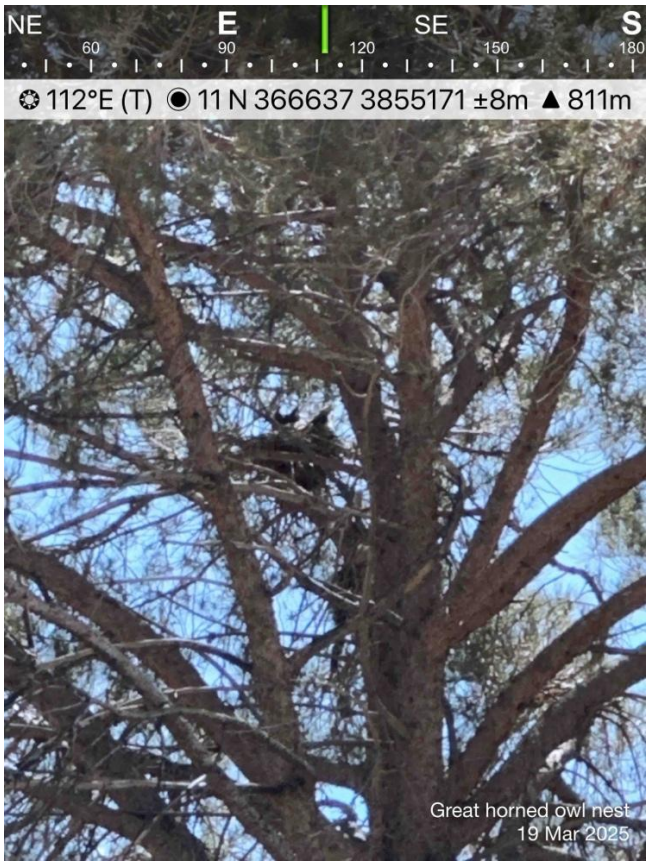


Photo 7. Active great-horned owl nest in pine tree in 5-mile buffer of the Proposed Euismod Project on 3/19/2025.



Photo 8. Close-up of active great-horned owl nest in pine tree in 5-mile buffer of the Proposed Euismod Project on 3/19/2025.

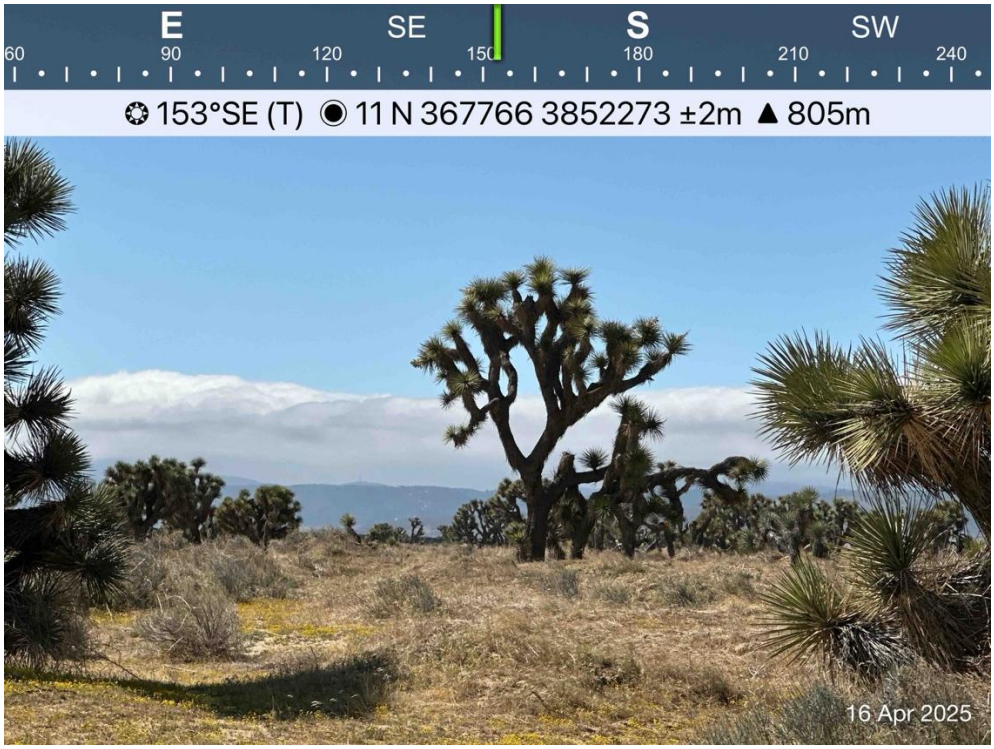


Photo 9. Active great-horned owl nest in western Joshua tree in 5-mile buffer of the Proposed Euismod Project on 4/16/2025.



Photo 10. Close-up of active great-horned owl nest in western Joshua tree in 5-mile buffer of the Proposed Euismod Project on 5/12/2025.



Photo 11. Close-up of active great-horned owl nest on power pole in 5-mile buffer of the Proposed Euismod Project on 4/16/2025.

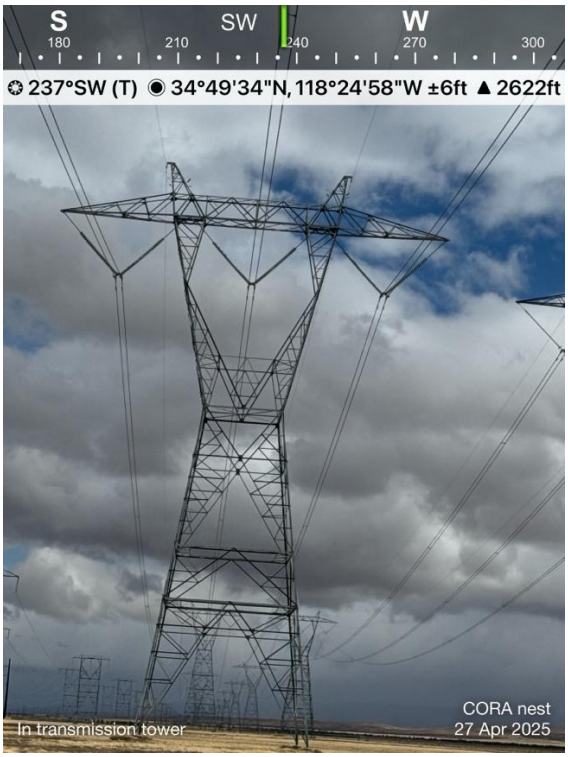


Photo 12. Active common raven nest near top of western horn of lattice transmission tower in 5-mile buffer of the Proposed Euismod Project on 4/27/2025.

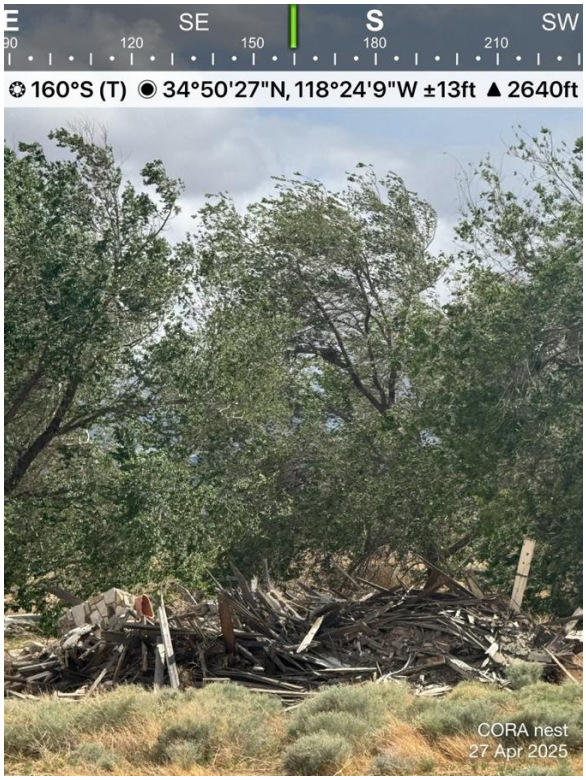


Photo 13. Active common raven nest in grove of trees in 5-mile buffer of the Proposed Euismod Project on 4/27/2025.



Photo 14. Active red-tailed hawk nest in western Joshua tree in 5-mile buffer of the Proposed Euismod Project on 4/16/2025.



Photo 15. Swainson's hawk adult with leg bands on elm tree in 5-mile buffer of the Proposed Euismod Project on 4/16/2025**.**



Photo 16. Swainson's hawk adult with leg bands on elm tree in 5-mile buffer of the Proposed Euismod Project on 6/16/2025**.**

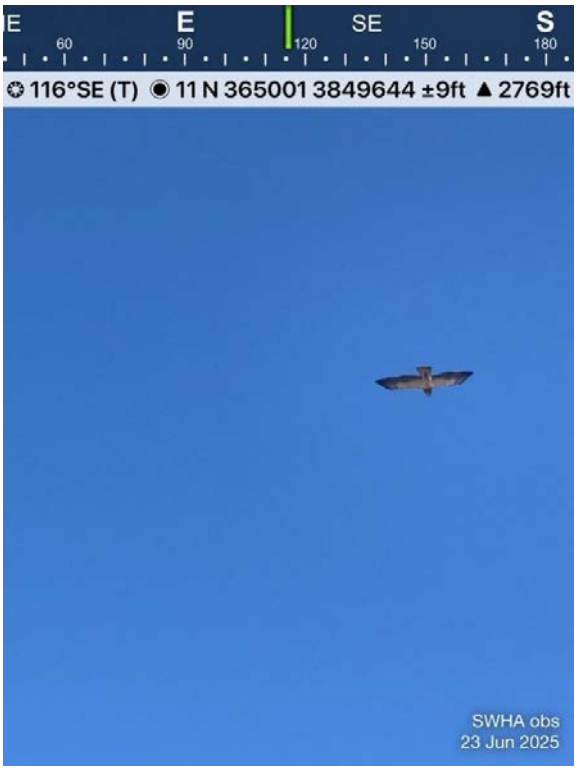


Photo 17. Swainson's hawk adult flying overhead approximately 0.5 miles outside of 5-mile buffer of the Proposed Euismod Project on 6/23/2025.



Photo 18. Aleppo pine with Swainson's hawk nest and one chick approximately 0.5 miles outside of 5-mile buffer of the Proposed Euismod Project on 6/23/2025.



Photo 19. Close-up of Aleppo pine with Swainson's hawk nest and one chick approximately 0.5 miles outside of 5-mile buffer of the Proposed Euismod Project on 6/23/2025.

Appendix C8
Western Joshua Tree Censuses

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Western Joshua Tree (*Yucca brevifolia*) Census

Euismod BESS Project Site

Prepared for:

TRC Solutions



Prepared by:
Lee Turner & Ryan Young
Phoenix Biological Consulting

November 29, 2024

Table of Contents

1.0 Executive Summary 3
2.0 Project Location and Description 3
3.0 Methods 7
4.0 Results 8
5.0 Discussion 9
5.0.1 Mitigation Fees for Joshua Tree Removal 9
6.0 References 10

1.0 Executive Summary

Phoenix Biological Consulting (Phoenix; PBC) was contracted to perform a pedestrian survey of western Joshua trees (*Yucca brevifolia*) for TRC Solutions, Inc (TRC) at the proposed Euismod Battery Energy Storage System (BESS) site (Exhibit 1 & 2). There were 418 western Joshua trees observed and recorded within the survey area. The data collected will be assimilated and submitted into California Department of Fish and Wildlife's (CDFW) Western Joshua Tree Conservation Permitting program.

2.0 Project Location and Description

The BESS site is located in unincorporated Kern County, California, approximately 15 miles west of Rosamond and 21 miles northwest of Lancaster. The survey area comprises approximately 145 acres (Exhibit 1) including the proposed development area and a 50-foot buffer. The survey area is gently sloping from northwest to southeast. The elevation range is from approximately 2,750 to 2,850 feet. Soils are sandy loams and according to the USDA Natural Resources Conservation Service (NRCS) there are three soil types: Rosamond fine sandy loam, Hesperia fine sandy loam 2-5% slopes and Cajon loamy sand 2-9% slopes (NRCS 2024). The site is heavily disturbed by off road vehicles and there is evidence of garbage dumping and evidence of grazing.

The vegetation at the site is dominated by creosote bush (*Larrea tridentata*), Ambrosia spp., annual grasses including cheatgrass (*Bromus tectorum*), Mediterranean grass (*Schismus barbatus*) and red brome (*Bromus rubens*). Forbs included tumble mustard (*Sisymbrium altissimum*) and storksbill (*Erodium cicutarium*). The site is sparsely populated by Joshua trees (Figure 1).



Figure 1. Site photo with creosote bush dominant vegetation. Joshua trees visible in background.

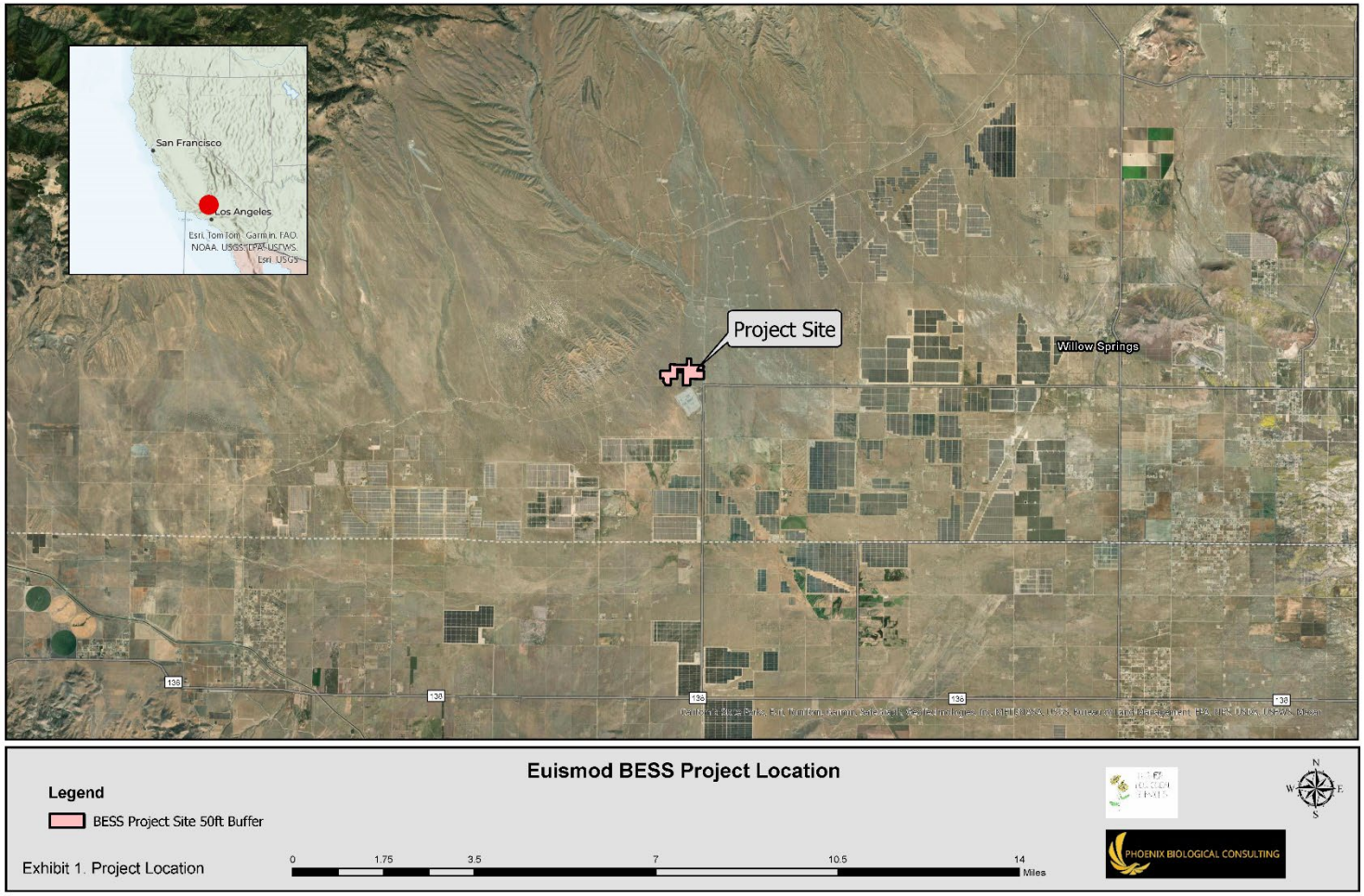


Exhibit 1: Regional View Project Location

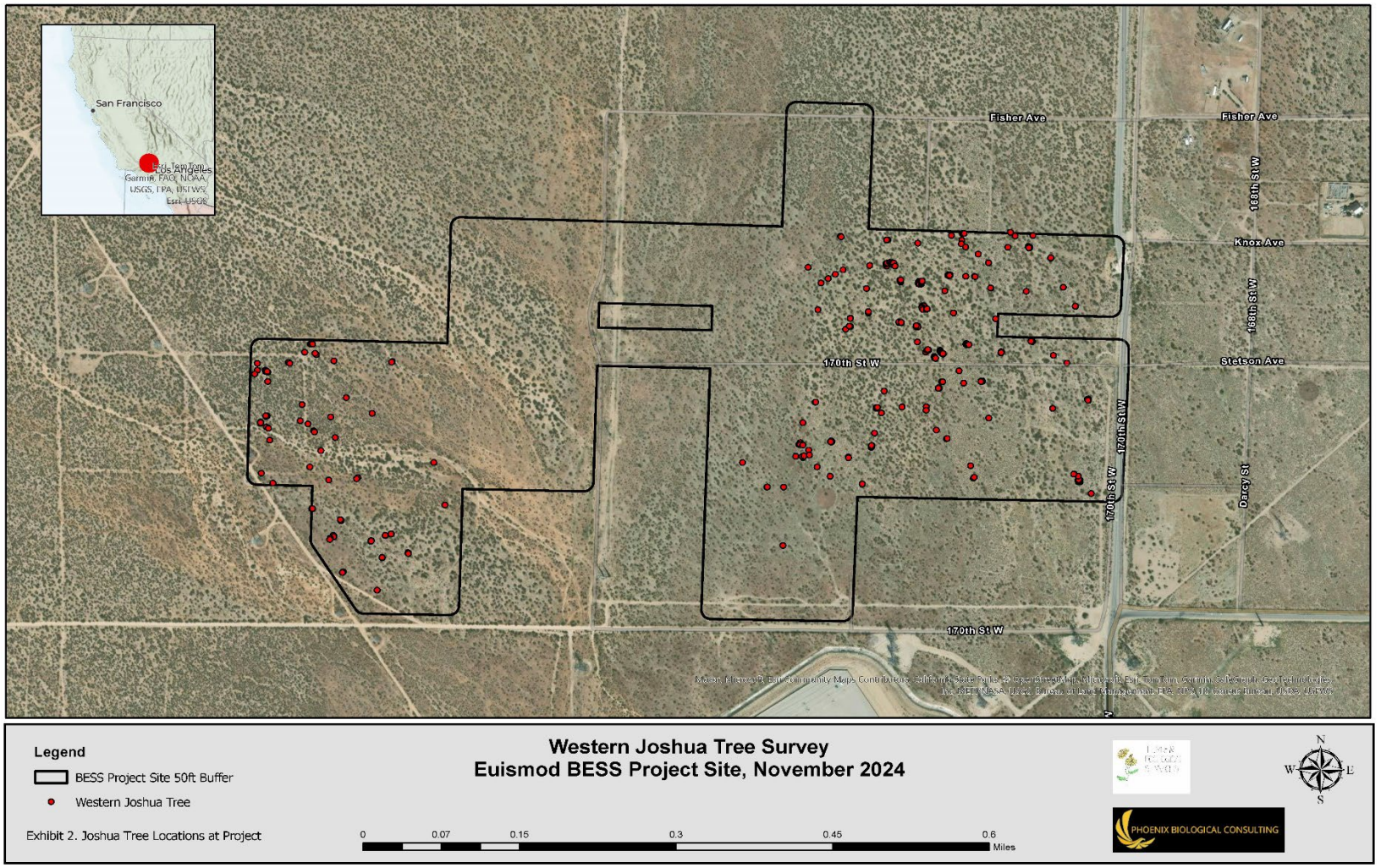


Exhibit 2. Joshua Tree Locations at Project

Exhibit 2: Joshua Tree Location within Survey Area

3.0 Methods

Dr. Lee Turner performed the pedestrian surveys from November 21 through November 25, 2024. Dr. Turner walked the entire proposed development area plus a 50-foot buffer surrounding the site (Exhibit 2). Transects were no more than 75 feet apart allowing for each individual Joshua tree to be readily observed. Data were collected in ARCGIS Field Map data form. An Eos Arrow 100 Submeter High Resolution GPS was used to provide accuracy of tree location between 1 meter and 25 centimeters in accuracy.

Per the CDFW western Joshua tree protocol (California Department of Fish and Wildlife, 2023) the following data were collected on each tree:

- Tree live or dead
- Tree maturity (tree branched or unbranched)
- Evidence of flowering or fruit
- Height class (A <1 meter, B 1-5.0 meters and C > 5.0 meters)
- Photograph of each tree. Where trees are grouped, bright tape was used to indicate the tree of interest in the photograph (Figure 2)



Figure 4. Photograph shows examples of bright ribbon used to denote which individual is the subject of that photo; an unbranched and branched tree, lack of flowering or fruits and various height of trees.

4.0 Results

There were 418 individual Joshua trees censused during the November 2024 survey. The data tables below show results of the various measures required by the CDFW to complete the Western Joshua Tree Conservation Permitting submittal. After review by the project development team, the data tables will be submitted to the CDFW database. See Appendix A for census spreadsheet.

Table 1. Results for 418 Joshua trees censused.

Measure	Category	Tree Count	Percent at Site
Height Class	A (<1 Meters)	137	32.78
	B (1-5 Meters)	248	59.33
	C (>5 Meters)	33	7.89
Phenology	Fruit	14	3.35
	None	404	96.65
Condition	Live	377	90.19
	Dead	41	9.81
Maturity	Branched	139	33.25
	Unbranched	279	66.75

5.0 Discussion

During the November 2024 pedestrian survey, Dr. Turner observed and collected data on 418 individual Joshua trees. Trees in the moderate Height Class (1 and 5 meters) make up the largest portion of Joshua trees at the site. The majority of the trees were live (377 out of 418), the majority (279 out of 418) were unbranched or immature and the majority (404 out of 418) displayed no current flowering or indications of recent fruiting.

Distribution of the Joshua trees across the site follows the distribution of soils. The Hesperia fine sandy loam contains about 80% of the Joshua trees and the Cajon loamy sand contains the remaining 20%.

5.0.1 Mitigation Fees for Joshua Tree Removal

The CDFW's Western Joshua Tree Conservation Permitting program sets out fees to be paid where Joshua trees will be removed per California Code FGC 1927; Western Joshua Tree Conservation Act. The BESS project falls in the 'reduced fee' area. Table 2 shows estimated cost for the Joshua tree permit if all trees are impacted. CDFW will determine the final fee. The fees apply to both living and dead trees and are based on height class.

Table 2. Tree count at all sizes and costs for permit.

Tree Size Class	Mitigation Fee per Tree (Live or Dead)	Tree Count at BESS	Total Fee
5 m or greater	$1,000	33	$33,000
Greater than 1 m but less than 5 m	$200	248	$49,600
Under 1 m	$150	137	$20,550
		TOTAL	$103,150

6.0 References

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Fish and Game Code - FGC CHAPTER 11.5. Western Joshua Tree Conservation Act [1927 - 1927.12] This chapter shall be known, and may be cited as, the Western Joshua Tree Conservation Act. *(Added by Stats. 2023, Ch. 51, Sec. 5. (SB 122) Effective July 10, 2023. Conditionally operative pursuant to Section 1927.2.)* https://wildlife.ca.gov/Conservation/Environmental-Review/WJT/Permitting/WJTCA-ITP

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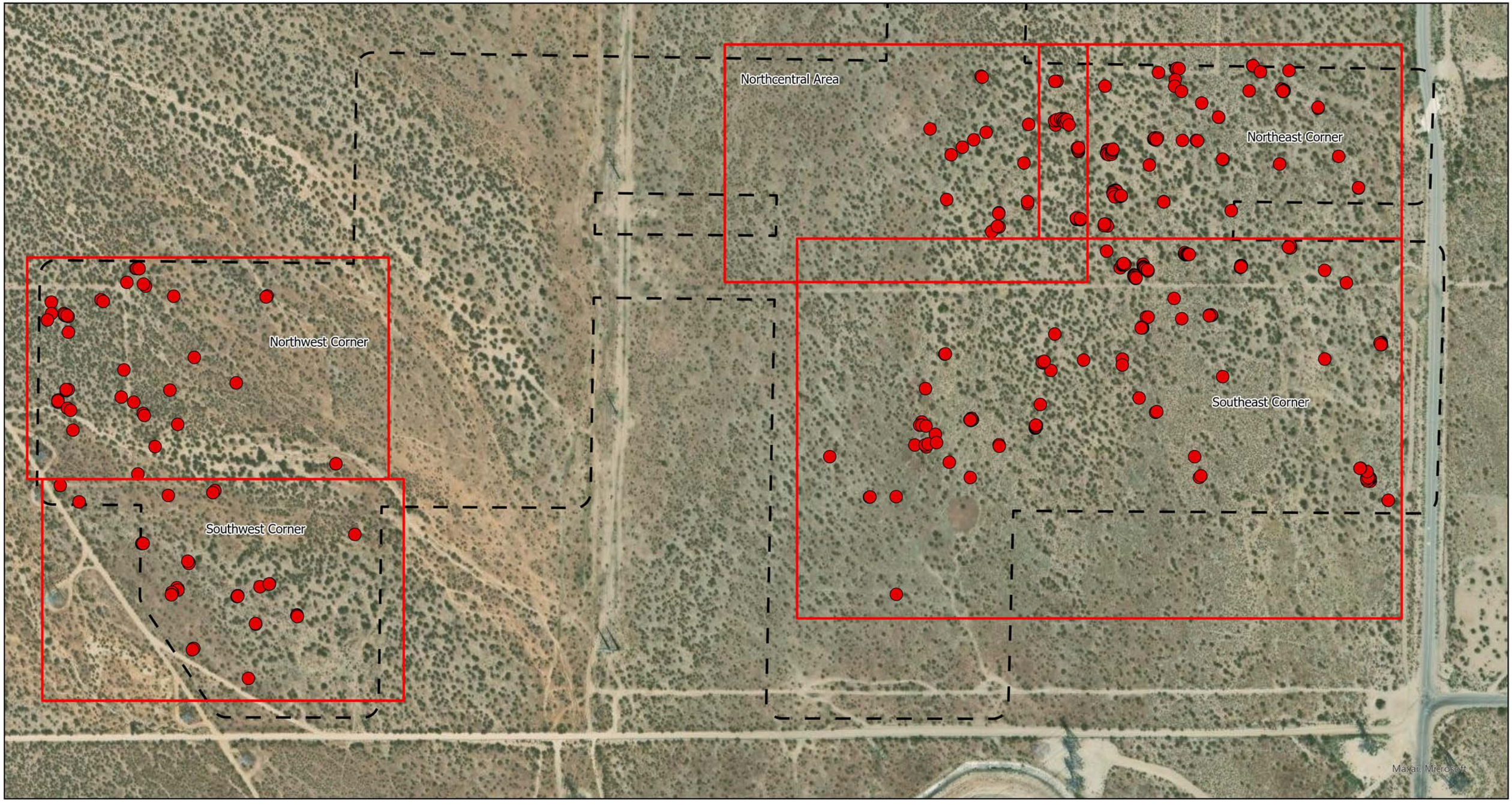
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APPENDIX A

Western Joshua Tree Locations at Euismod BESS Project Site



Legend

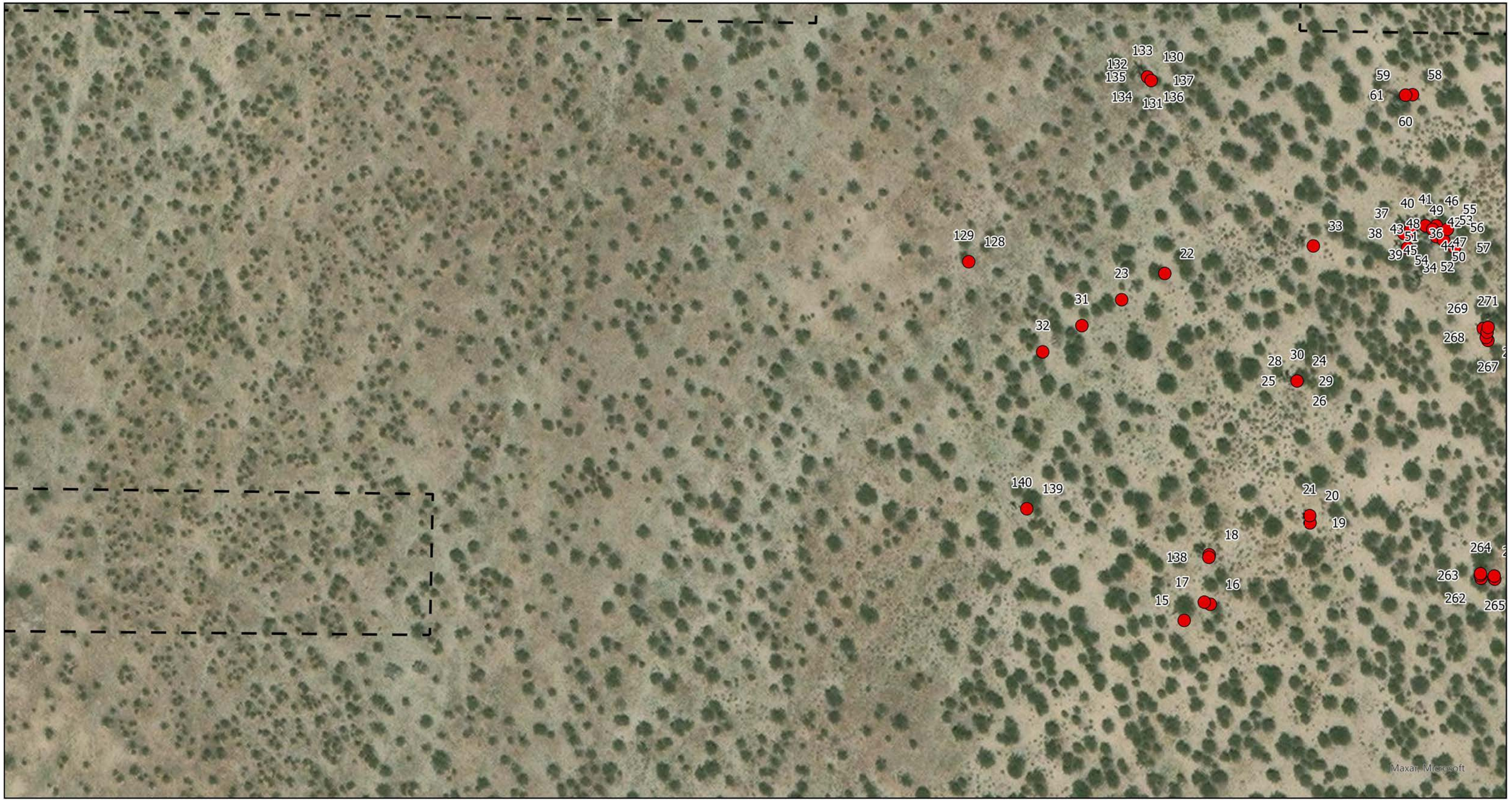
- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

Western Joshua Tree Survey
Euismod BESS Project Site
Index Map

0 0.04 0.09 0.17 0.26 0.34 Miles

N W E S

PHOENIX BIOLOGICAL CONSULTING



Legend

- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

Western Joshua Tree Survey
Euismod BESS Project Site
Northcentral Area

0 0.01 0.03 0.05 0.08 0.1 Miles

N W E S

PHOENIX BIOLOGICAL CONSULTING

Legend

- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

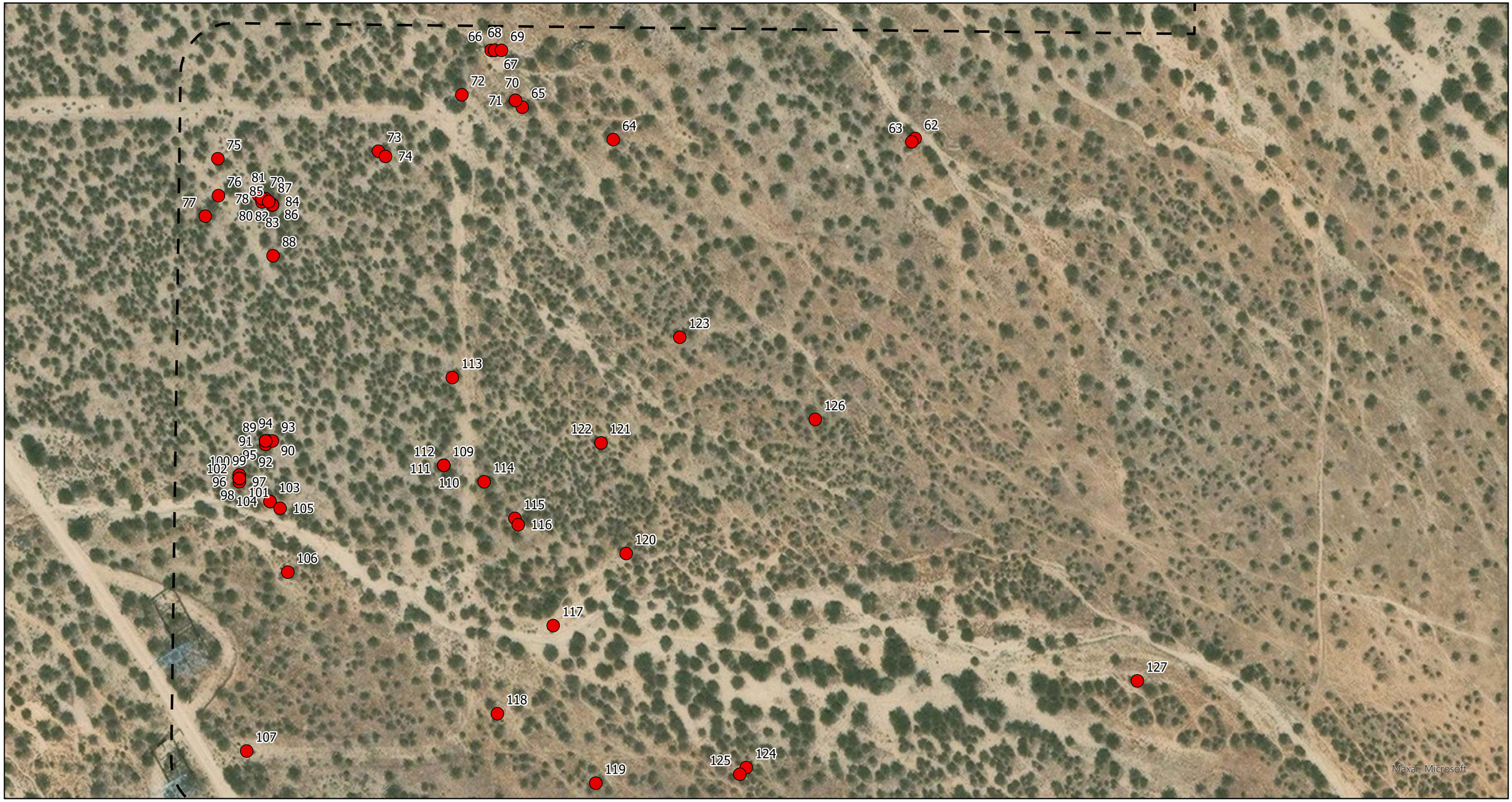
Western Joshua Tree Survey
Euismod BESS Project Site
Northeast Corner

0 0.01 0.01 0.03 0.04 0.06
Miles

N
W E
S

PHOENIX BIOLOGICAL CONSULTING

Maxar, Microsoft



Legend

- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

Western Joshua Tree Survey
Euismod BESS Project Site
Northwest Corner

0 0.01 0.03 0.05 0.08 0.1 Miles

N W E S

PHOENIX BIOLOGICAL CONSULTING

Legend

- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

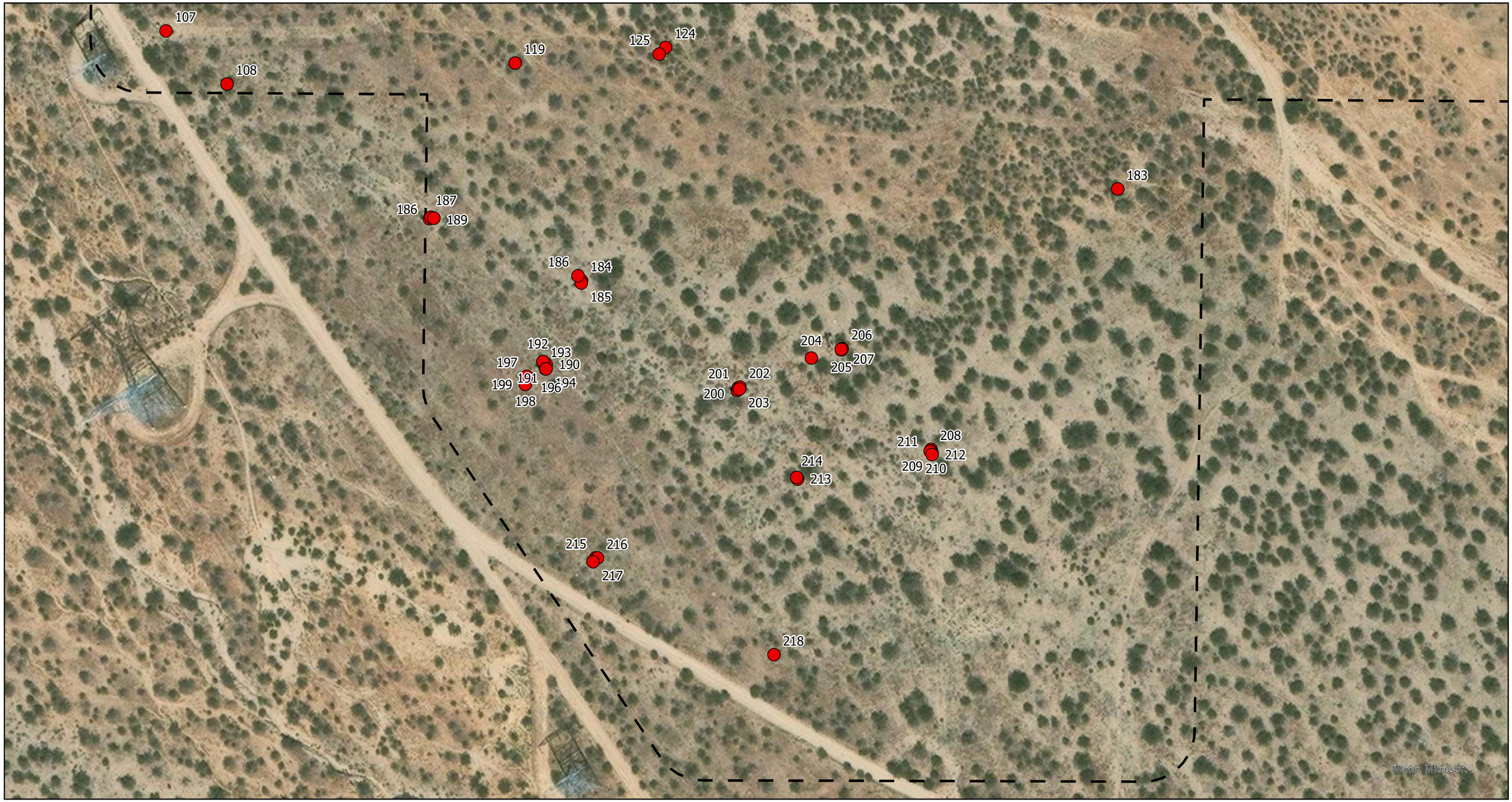
Western Joshua Tree Survey
Euismod BESS Project Site
Southeast Corner

0 0.02 0.04 0.08 0.12 0.16 Miles

N W E S

PHOENIX BIOLOGICAL CONSULTING

Maxar, Microsoft



Legend

- Western Joshua Tree Locations
- Project Boundary with 50 foot buffer

Western Joshua Tree Survey
Euismod BESS Project Site
Southwest Corner

0 0.01 0.03 0.05 0.08 0.1 Miles

N W E S

PHOENIX BIOLOGICAL CONSULTING

APPENDIX B

Western Joshua Tree Photolog at Euismod BESS Project Site



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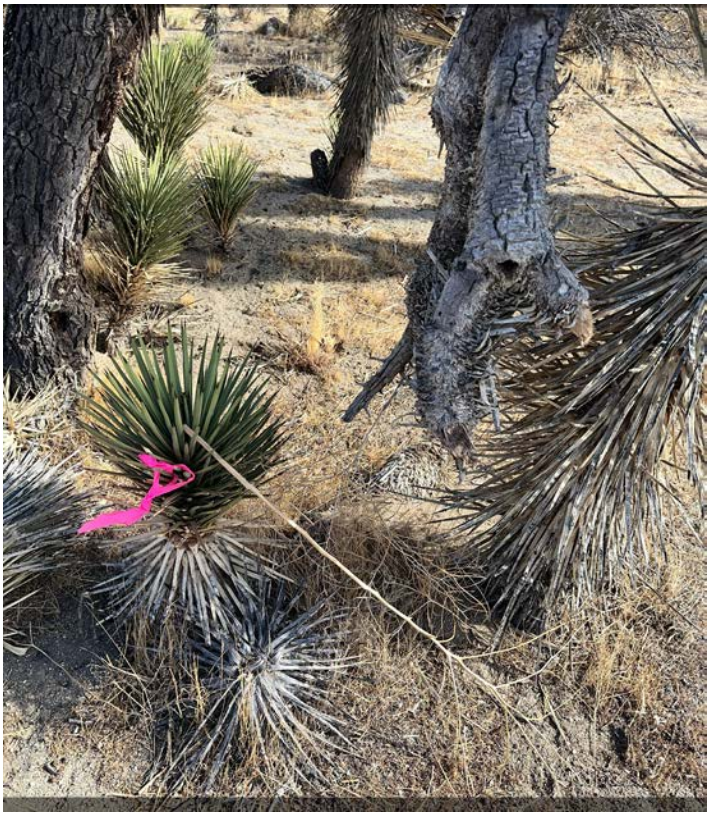
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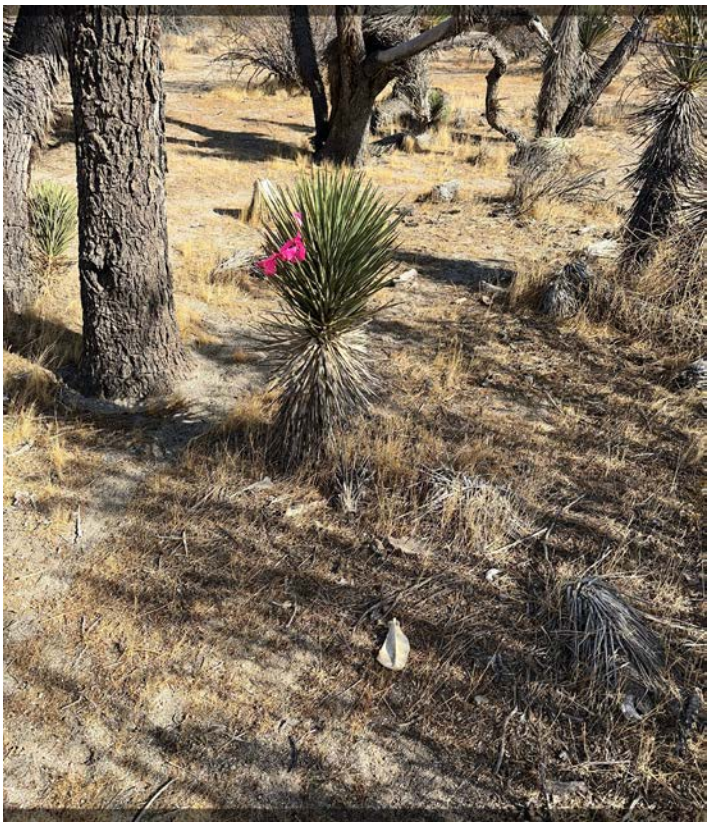
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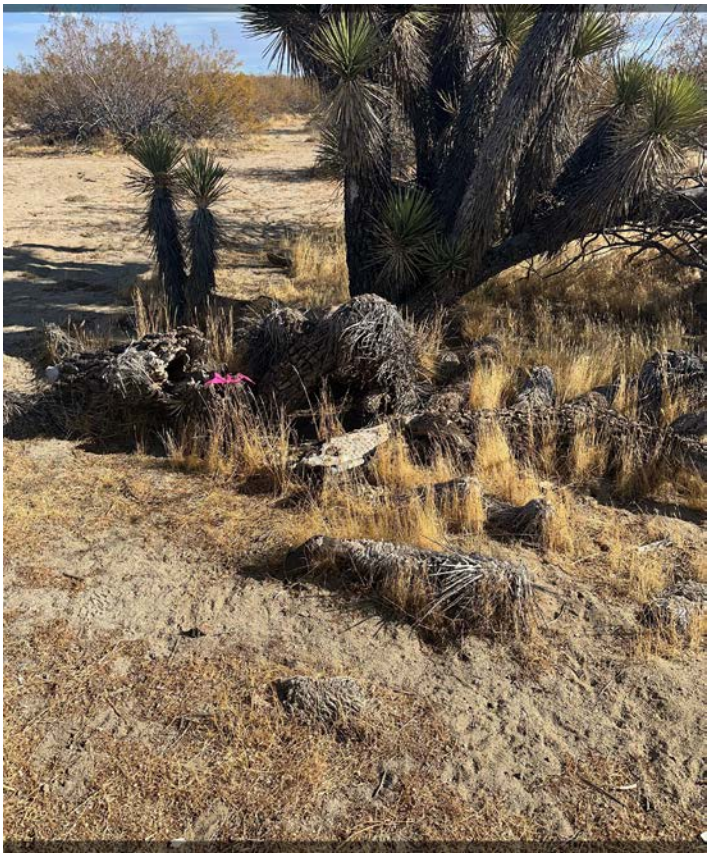
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WJT 59, E368723.27 N3859343.82



WJT 60, E368723.27 N3859343.82



WJT 61, E368723.27 N3859343.82



WJT 62, E367961.25 N3859148.89



WJT 63, E367960.23 N3859147.91



WJT 64, E367871.20 N3859149.86



WJT 65, E367844.20 N3859159.90



WJT 66, E367835.21 N3859176.89



WJT 67, E367836.21 N3859176.88



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WJT 69, E367838.22 N3859176.85



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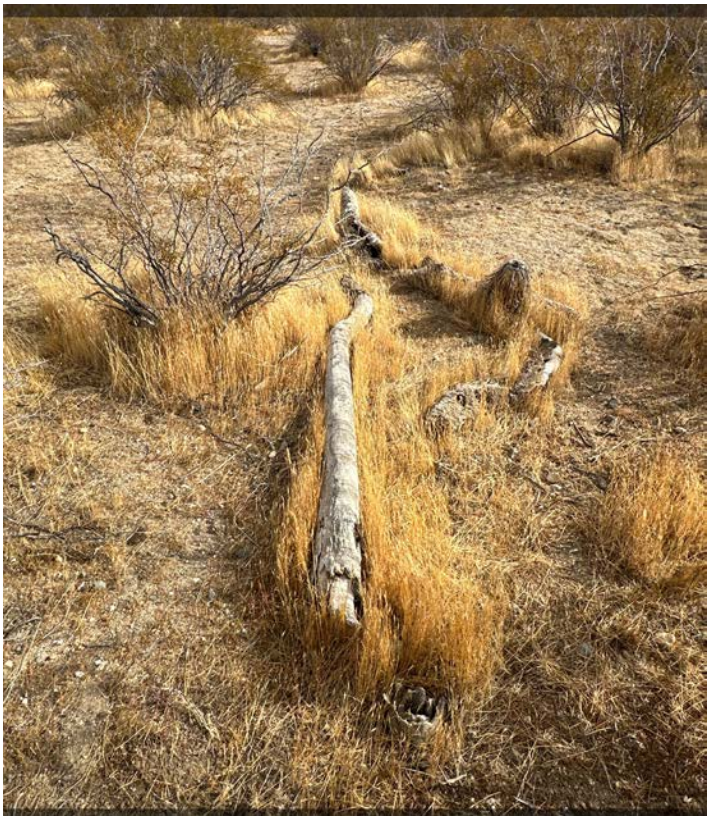
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WJT 73, E367801.12 N3859147.44



WJT 74, E367803.22 N367803.22



WJT 75, E367753.20 N3859145.91



WJT 76, E367753.23 N3859134.92



WJT 77, E367749.21 N3859128.88



WJT 78, E367766.20 N3859133.85



WJT 79, E367767.20 N3859133.85



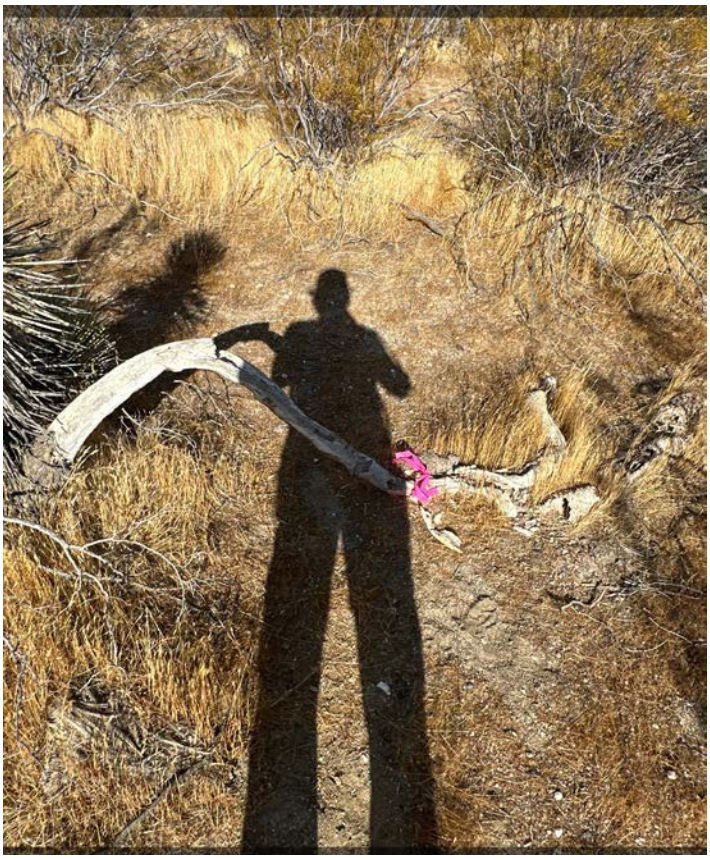
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WJT 82, E367766.20 N3859133.85



WJT 83, E367769.28 N3859131.92



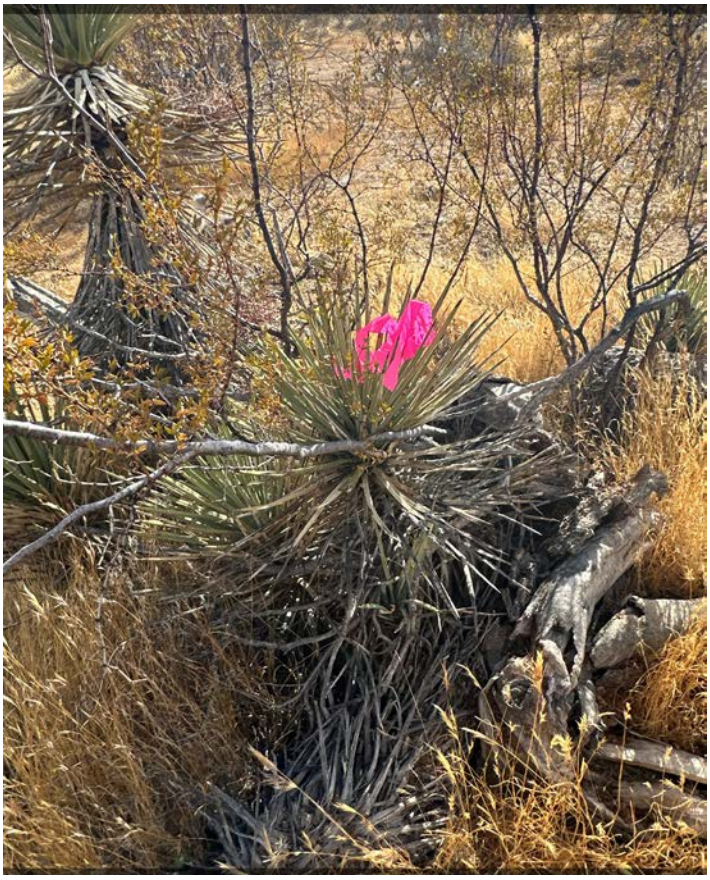
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WJT 87, E367768.19 N3859132.93



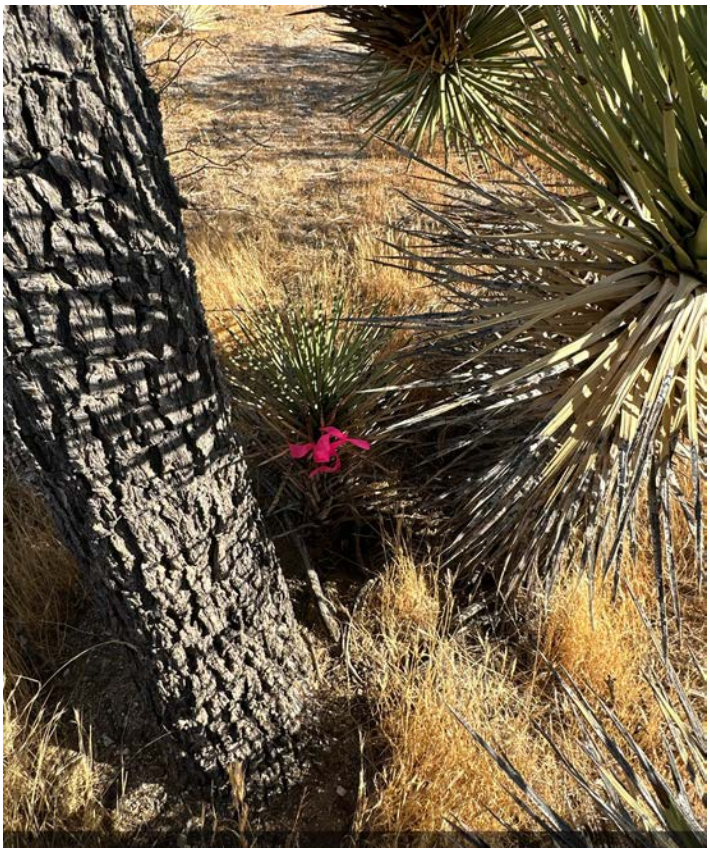
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WJT 90, E367767.25 N3859061.85



WJT 91, E367766.25 N3859061.85



WJT 92, E367766.25 N3859060.85



WJT 93, E367768.25 N3859061.85



WJT 94, E367766.25 N3859061.85



WJT 95, E367766.25 N3859061.85



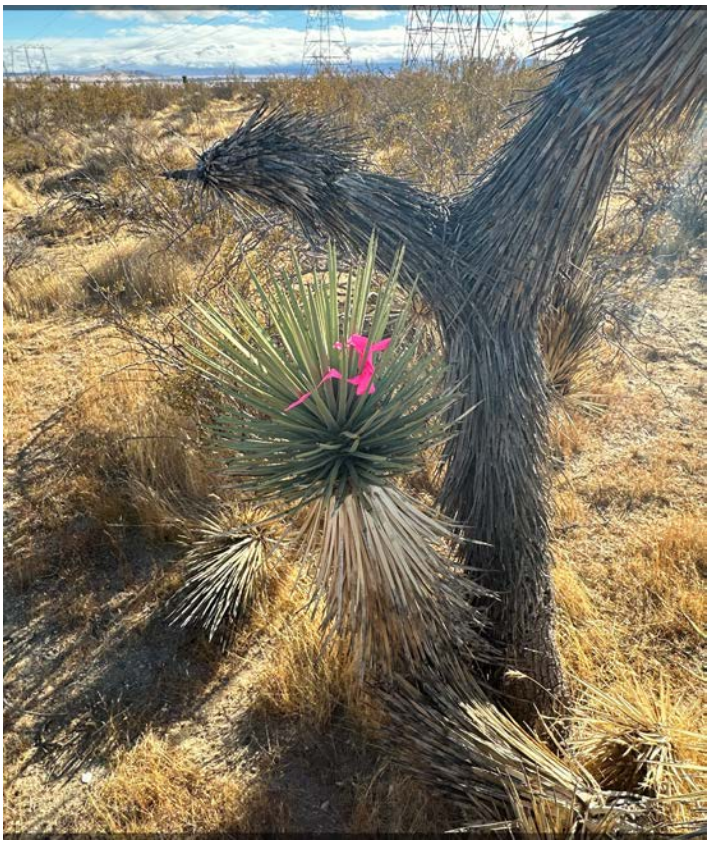
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WJT 100, E367758.23 N3859051.88



WJT 101, E367758.23 N3859050.88



WJT 102, E367758.23 N3859050.88



WJT 103, E367767.27 N3859043.87



WJT 104, E367767.27 N3859043.87



WJT 105, E367770.26 N3859041.83



WJT 106, E367772.27 N3859022.83



WJT 107, E367759.26 N3858969.88



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WJT 109, E367819.26 N3859053.88



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WJT 111, E367819.26 N3859053.88



WJT 112, E367819.26 N3859053.88



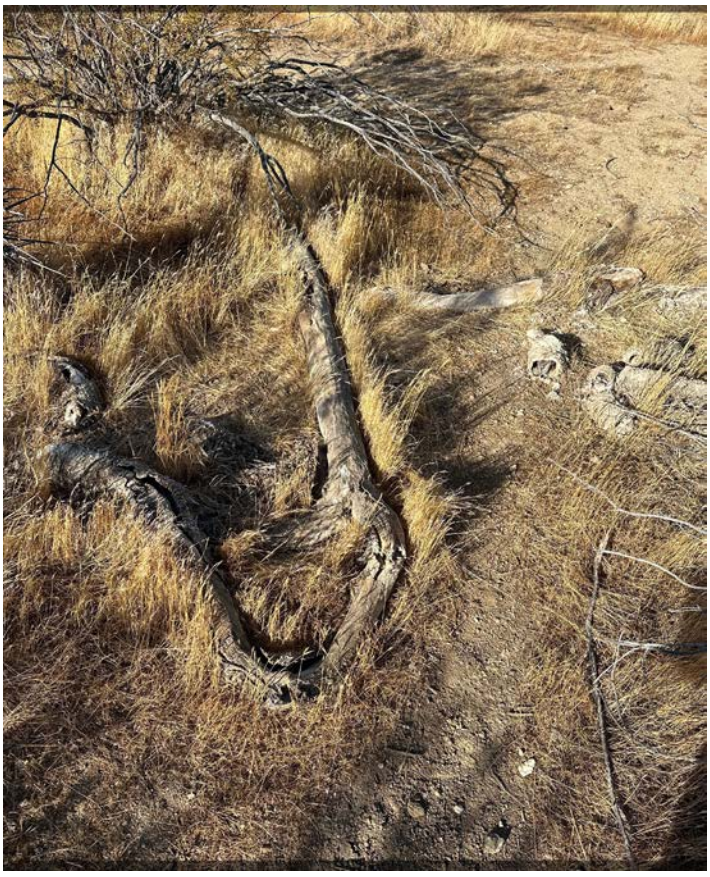
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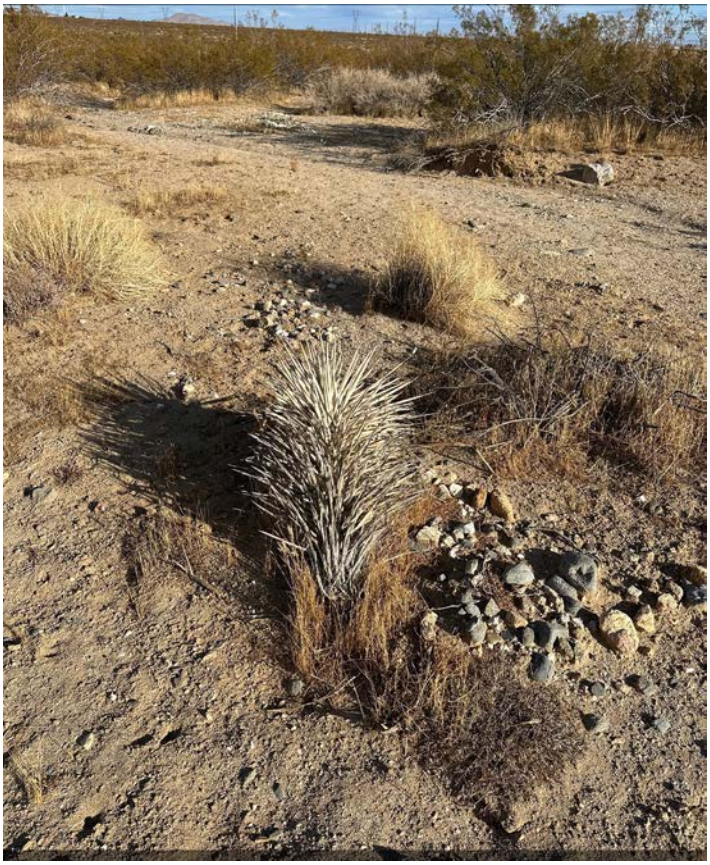
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WJT 116, E367841.22 N3859035.92



WJT 117, E367851.21 N3859005.83



WJT 118, E367834.19 N3858979.90



WJT 119, E367863.24 N3858958.84



WJT 120, E367873.27 N3859026.92



WJT 121, E367866.25 N3859059.86



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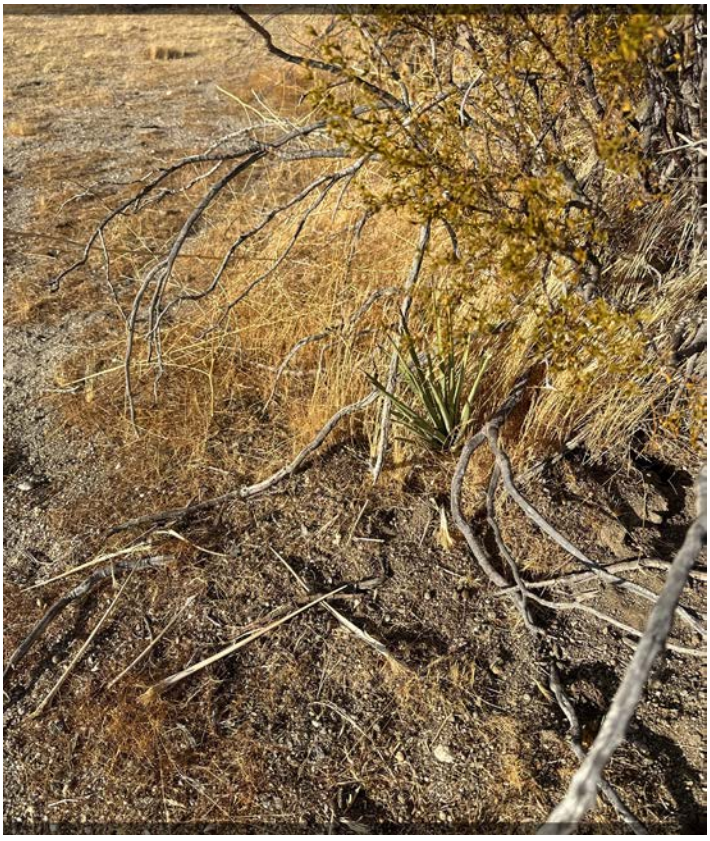
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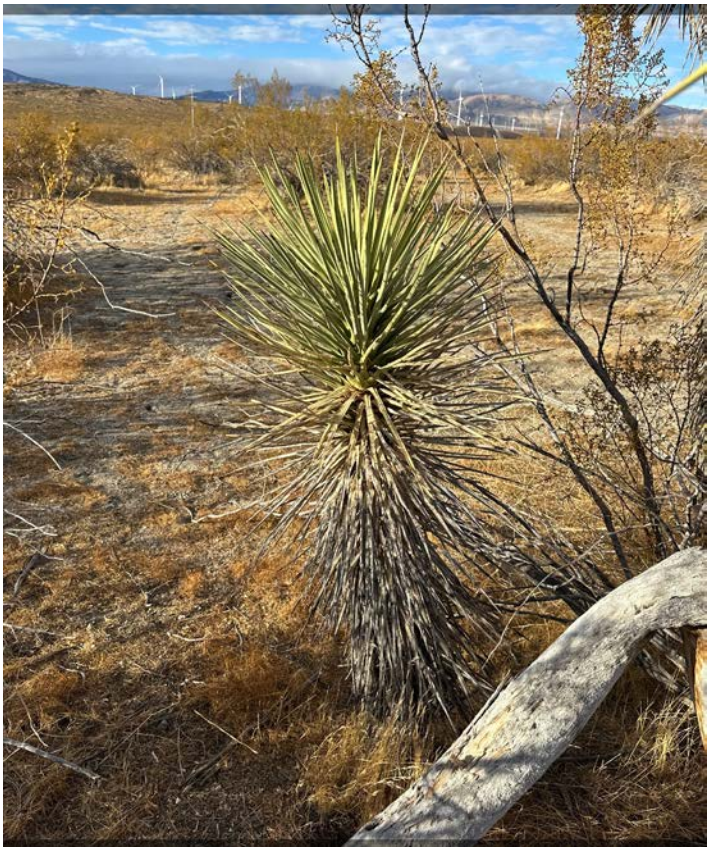
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WJT 131, E368652.22 N3859349.83



WJT 132, E368652.22 N3859349.83



WJT 133, E368652.22 N3859349.83



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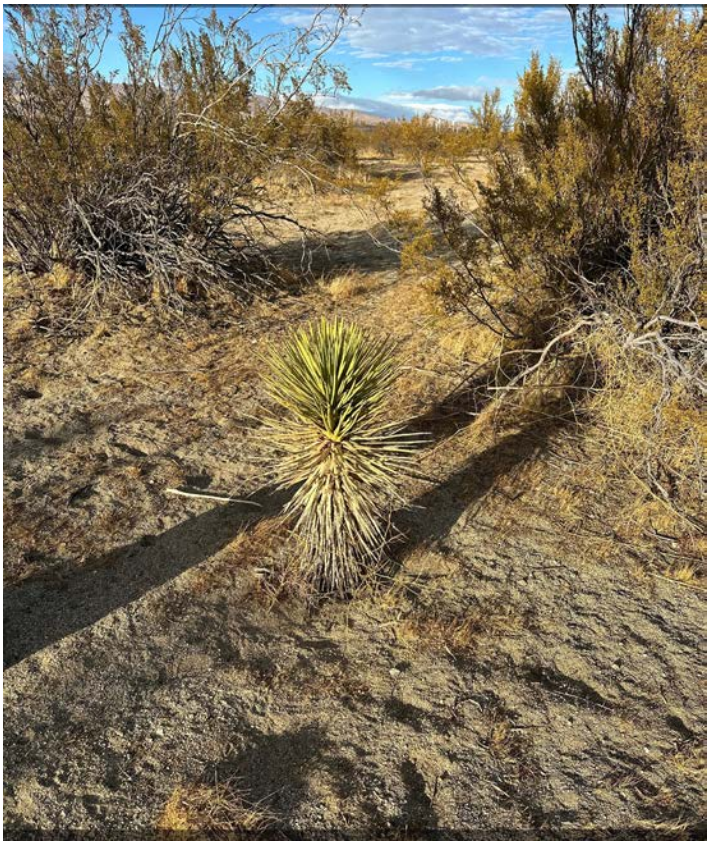
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WJT 139, E368617.25 N3859231.86



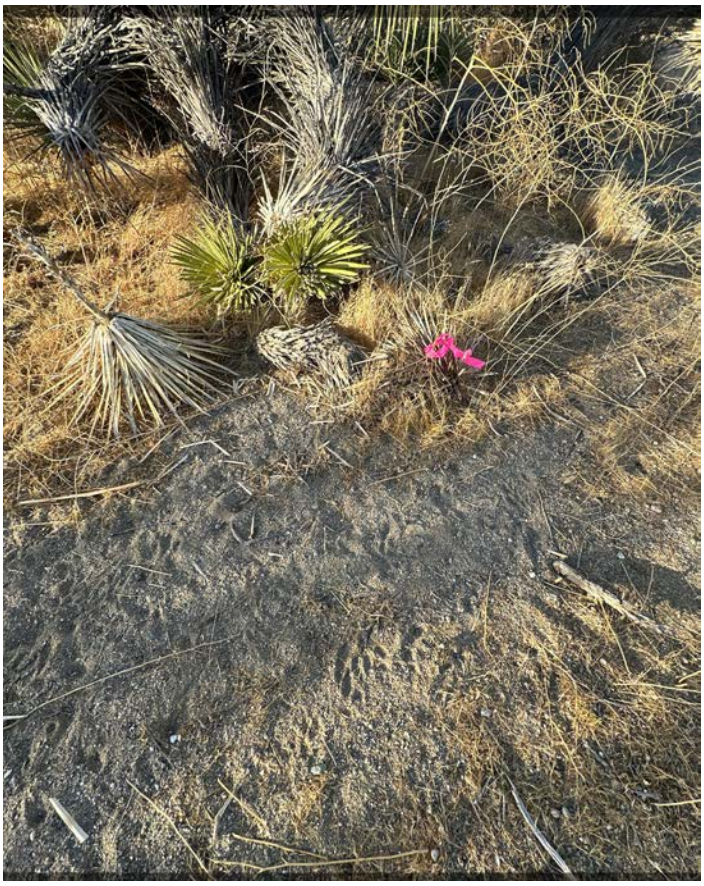
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WJT 143, E368594.27 N3859050.83



WJT 144, E368590.24 N3859018.82



WJT 145, E368590.24 N3859018.82



WJT 146, E368590.24 N3859018.82



WJT 147, E368590.24 N3859018.82



WJT 148, E368588.19 N3859015.86



WJT 149, E368590.20 N3859015.83



WJT 150, E368590.20 N3859015.83



WJT 151, E368594.21 N3859014.89



WJT 152, E368583.25 N3858996.85



WJT 153, E368583.25 N3858996.85



WJT 154, E368583.25 N3858996.85



WJT 155, E368594.20 N3858994.92



WJT 156, E368593.22 N3858996.82



WJT 157, E368596.16 N3858997.77



WJT 158, E368603.24 N3859006.88



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WJT 162, E368603.24 N3859006.88



WJT 163, E368603.24 N3859006.88



WJT 164, E368604.22 N3858998.88



WJT 165, E368604.22 N3858998.88



WJT 166, E368604.22 N3858998.88



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WJT 168, E368616.20 N3858979.85



WJT 169, E368604.22 N3858998.88



WJT 170, E368636.19 N3858964.92



WJT 171, E368636.19 N3858964.92



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WJT 173, E368636.19 N3858964.92



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WJT 176, E368636.19 N3858964.92



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WJT 179, E368539.11 N3858947.55



WJT 180, E368538.79 N3858947.54



WJT 181, E368539.31 N3858947.74



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WJT 187, E367837.44 N3858913.49



WJT 188 E367871.20 N3858869.27



WJT 189, E367838.34 N3858913.17



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WJT 191, E367870.24 N3858870.14



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WJT 194, E367871.15 N3858867.98



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WJT 200, E367928.11 N3858860.79



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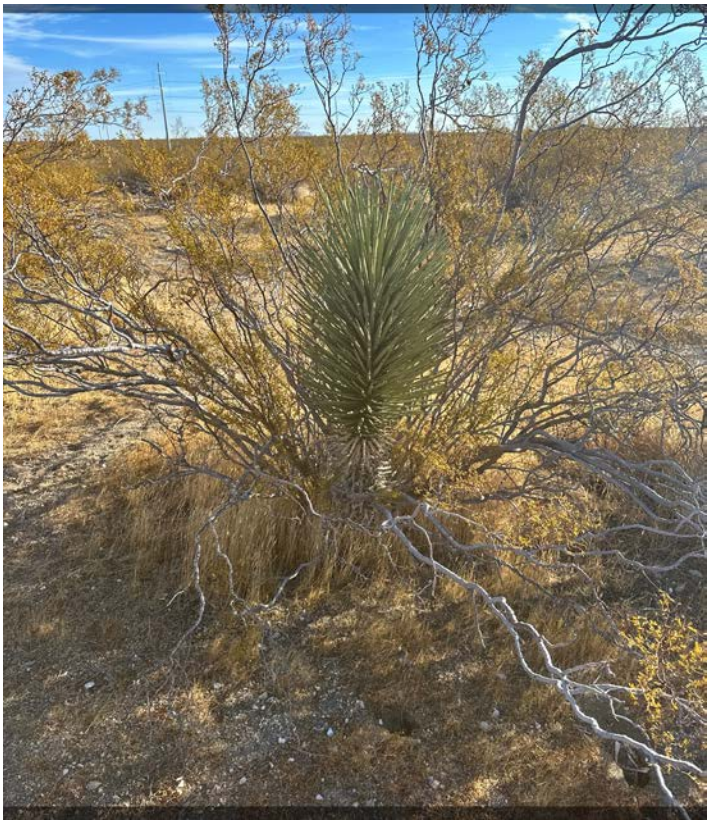
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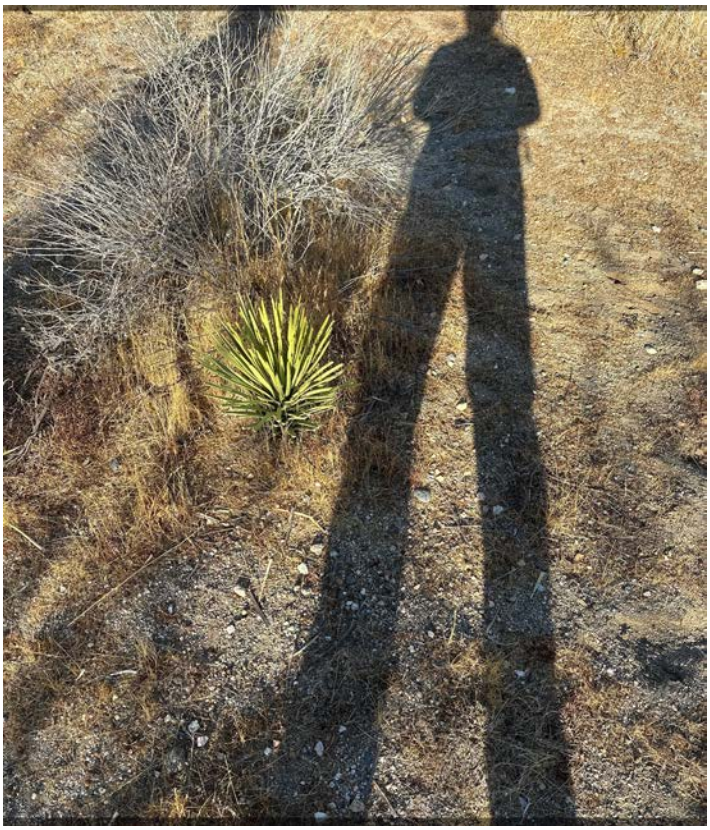
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WJT 209, E367985.87 N3858841.53



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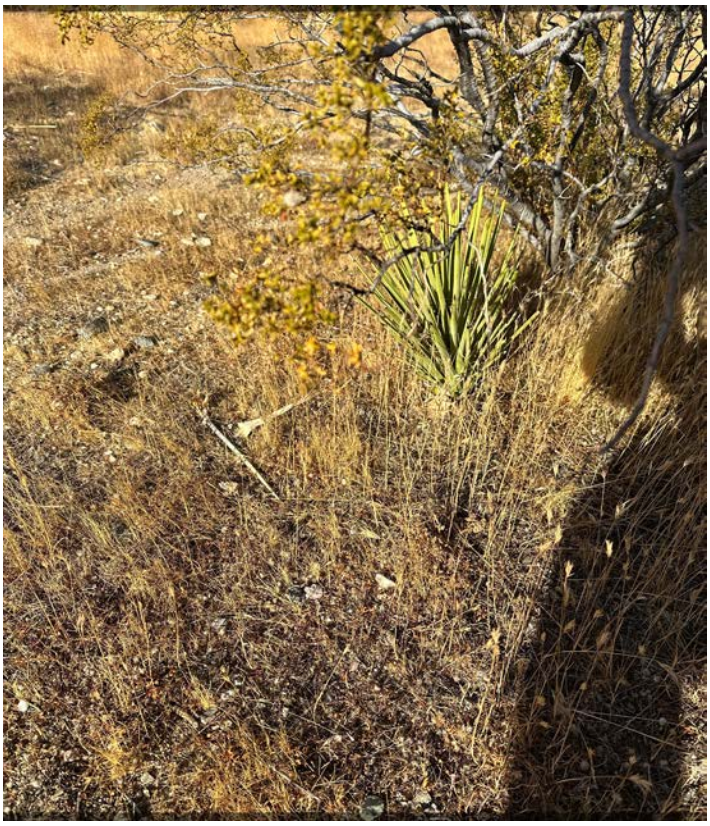
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WJT 218, E367937.90 N3858782.20



WJT 219, E369034.19 N3859088.76



WJT 220. E369034.26 N3859088.30



WJT 221, E369034.17 N3859087.57



WJT 222, E369032.83 N3859088.25



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WJT 241, E369012.35 N3858968.56



WJT 242, E369012.19 N3858968.47



WJT 243, E369011.84 N3858968.36



WJT 245, E369001.29 N3859146.56



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WJT 251, E368699.43 N3859012.17



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WJT 355, E368826.46 N3859227.01



WJT 356, E368826.41 N3859226.64



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WJT 384, E368870.60 N3859117.69



WJT 385, E368868.76 N3859117.39



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WJT 388, E368880.76 N3859058.22



WJT 389, E368947.46 N3859180.69



WJT 390, E368947.96 N3859180.92



WJT 391, Exxxxxx.xx Nxxxxxx.xx



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WJT 394, E368945.96 N3859181.73



WJT 395, E368945.97 N3859181.46



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WJT 401, E368913.97 N3859356.08



WJT 402, E368914.27 N3859356.08



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WJT 404, E368948.87 N3859350.88



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WJT 407, E368943.55 N 3859332.20



WJT 408, E368943.93 N3859332.04



WJT 409, E368943.72 N3859331.17



WJT 410, E368943.14 N3859331.51



WJT 411, E368942.74 N3859330.78



WJT 412, E368942.77 N3859331.18



WJT 413, 368938.58, 3859261.40



WJT 414, E368976.45 N3859314.41



WJT 415, E368976.40 N3859315.28



WJT 416, E368995.60 N3859267.91



WJT 417, E369014.21 N3859237.11



WJT 418, E369014.23 N3859237.66

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
1	None	Live	No	B	368685.79	3858952.34
2	None	Live	No	A	368685.80	3858952.61
3	None	Live	No	B	368664.41	3858995.95
4	None	Live	No	B	368664.62	3858994.53
5	None	Live	Yes	B	368639.10	3859020.36
6	None	Live	No	A	368638.48	3859020.79
7	None	Live	No	B	368637.82	3859021.61
8	None	Live	Yes	B	368638.27	3859021.58
9	None	Live	Yes	B	368636.63	3859020.38
10	None	Live	No	A	368637.24	3859020.65
11	None	Live	No	A	368637.50	3859019.64
12	Fruit	Live	Yes	B	368636.99	3859020.22
13	None	Live	No	B	368613.33	3859083.59
14	None	Live	Yes	B	368613.95	3859083.89
15	None	Dead	No	B	368660.19	3859200.60
16	None	Dead	Yes	B	368667.47	3859204.94
17	None	Dead	No	B	368665.80	3859205.56
18	None	Live	Yes	B	368667.34	3859218.52
19	Fruit	Live	Yes	B	368695.26	3859226.86
20	None	Live	No	A	368695.20	3859228.86
21	None	Live	Yes	A	368695.20	3859228.86
22	Fruit	Live	Yes	B	368656.20	3859295.87
23	None	Live	No	A	368644.22	3859288.83
24	None	Live	Yes	B	368692.25	3859265.84
25	None	Live	No	B	368692.25	3859265.84
26	None	Live	No	B	368692.25	3859265.84
27	None	Live	No	B	368692.25	3859265.84
28	None	Live	No	A	368692.25	3859265.84
29	None	Live	No	A	368692.25	3859265.84
30	None	Live	Yes	B	368692.25	3859265.84
31	None	Live	No	B	368633.15	3859281.89
32	None	Live	No	B	368622.26	3859274.83
33	Fruit	Live	Yes	B	368697.26	3859302.82
34	Fruit	Live	Yes	B	368723.22	3859301.89
35	None	Live	No	B	368722.25	3859304.90
36	None	Live	No	B	368723.25	3859305.90
37	None	Live	No	A	368722.27	3859305.90
38	None	Live	No	A	368722.27	3859305.90
39	Fruit	Live	Yes	C	368724.20	3859306.87
40	None	Live	No	A	368724.20	3859306.87
41	None	Live	No	A	368728.24	3859307.92
42	None	Live	No	A	368728.24	3859307.92
43	None	Live	No	A	368728.24	3859307.92
44	None	Live	Yes	C	368728.24	3859307.92
45	None	Live	Yes	B	368728.24	3859307.92
46	None	Live	No	A	368731.26	3859307.88

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
47	None	Live	Yes	B	368730.24	3859306.90
48	None	Live	No	A	368732.22	3859304.87
49	None	Live	No	A	368731.21	3859304.88
50	None	Live	No	B	368731.21	3859304.88
51	None	Live	Yes	B	368732.23	3859305.87
52	None	Live	No	A	368733.21	3859303.86
53	None	Live	No	A	368733.21	3859303.86
54	None	Live	No	A	368733.21	3859303.86
55	Fruit	Live	Yes	B	368734.26	3859306.84
56	None	Live	No	B	368736.20	3859301.82
57	None	Live	Yes	B	368736.20	3859301.82
58	None	Live	Yes	C	368725.19	3859343.91
59	None	Live	No	B	368723.27	3859343.82
60	None	Live	No	B	368723.27	3859343.82
61	None	Dead	Yes	B	368723.27	3859343.82
62	None	Live	No	B	367961.25	3859148.89
63	None	Dead	No	B	367960.23	3859147.91
64	None	Live	No	B	367871.20	3859149.86
65	None	Live	Yes	B	367844.20	3859159.90
66	None	Live	Yes	C	367835.21	3859176.89
67	None	Live	No	B	367836.21	3859176.88
68	None	Live	No	B	367836.21	3859176.88
69	None	Dead	Yes	B	367838.22	3859176.85
70	None	Dead	Yes	B	367842.21	3859161.93
71	None	Dead	No	B	367842.21	3859161.93
72	None	Dead	Yes	C	367826.24	3859163.82
73	None	Live	Yes	B	367801.12	3859147.44
74	None	Dead	Yes	B	367803.22	3859145.85
75	None	Live	No	B	367753.20	3859145.91
76	None	Dead	No	A	367753.23	3859134.92
77	None	Live	No	B	367749.21	3859128.88
78	None	Live	No	A	367766.20	3859133.85
79	None	Live	No	A	367767.20	3859133.85
80	None	Live	No	A	367766.20	3859132.85
81	None	Live	No	B	367765.20	3859134.85
82	None	Live	No	A	367766.20	3859133.85
83	None	Dead	Yes	B	367769.28	3859131.92
84	None	Live	No	B	367769.28	3859131.92
85	None	Live	No	A	367769.28	3859131.92
86	None	Live	No	A	367769.28	3859131.92
87	None	Live	No	A	367768.19	3859132.93
88	None	Live	No	B	367769.24	3859116.83
89	None	Live	No	A	367766.25	3859061.85
90	None	Live	No	B	367767.25	3859061.85
91	None	Live	No	A	367766.25	3859061.85
92	None	Live	No	B	367766.25	3859060.85

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
93	None	Live	No	B	367768.25	3859061.85
94	None	Live	No	B	367766.25	3859061.85
95	None	Live	Yes	B	367766.25	3859061.85
96	None	Live	No	B	367758.23	3859050.88
97	None	Dead	No	B	367758.23	3859049.88
98	None	Live	No	A	367758.23	3859050.88
99	None	Live	No	A	367758.23	3859050.88
100	None	Live	No	B	367758.23	3859051.88
101	None	Live	No	B	367758.23	3859050.88
102	None	Dead	Yes	B	367758.23	3859050.88
103	None	Live	No	A	367767.27	3859043.87
104	None	Live	No	A	367767.27	3859043.87
105	None	Live	Yes	B	367770.26	3859041.83
106	None	Live	No	B	367772.27	3859022.83
107	None	Live	No	B	367759.26	3858969.88
108	None	Live	Yes	B	367777.22	3858953.87
109	None	Live	Yes	B	367819.26	3859053.88
110	None	Live	No	A	367819.26	3859053.88
111	None	Live	Yes	B	367819.26	3859053.88
112	None	Live	No	B	367819.26	3859053.88
113	None	Dead	Yes	B	367822.19	3859079.91
114	None	Live	No	A	367831.26	3859048.83
115	None	Live	No	B	367840.24	3859037.82
116	None	Dead	Yes	B	367841.22	3859035.92
117	None	Dead	No	A	367851.21	3859005.83
118	None	Live	No	B	367834.19	3858979.90
119	None	Live	No	A	367863.24	3858958.84
120	None	Live	No	A	367873.27	3859026.92
121	None	Live	No	B	367866.25	3859059.86
122	None	Live	No	B	367866.25	3859059.86
123	None	Live	No	A	367890.19	3859090.90
124	None	Live	No	B	367908.19	3858962.85
125	None	Live	No	B	367906.24	3858960.89
126	None	Live	No	A	367930.25	3859065.92
127	None	Live	No	A	368025.20	3858986.90
128	None	Live	No	A	368602.23	3859299.86
129	None	Live	Yes	B	368602.23	3859299.86
130	None	Live	No	B	368652.22	3859349.83
131	None	Live	Yes	B	368652.22	3859349.83
132	None	Live	Yes	B	368652.22	3859349.83
133	None	Dead	No	B	368652.22	3859349.83
134	None	Live	No	B	368652.22	3859349.83
135	None	Live	No	B	368652.22	3859349.83
136	None	Live	No	A	368652.22	3859349.83
137	None	Live	No	B	368653.22	3859348.82
138	None	Live	Yes	C	368667.25	3859217.84

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
139	None	Live	Yes	B	368617.25	3859231.86
140	None	Live	No	A	368617.25	3859231.86
141	None	Live	Yes	B	368594.27	3859050.83
142	None	Live	Yes	C	368594.27	3859050.83
143	None	Dead	No	A	368594.27	3859050.83
144	None	Live	No	A	368590.24	3859018.82
145	None	Live	No	A	368590.24	3859018.82
146	None	Live	No	A	368590.24	3859018.82
147	None	Live	No	A	368590.24	3859018.82
148	None	Live	No	B	368588.19	3859015.86
149	None	Live	Yes	B	368590.20	3859015.83
150	None	Live	Yes	B	368590.20	3859015.83
151	None	Live	No	A	368594.21	3859014.89
152	None	Live	Yes	C	368583.25	3858996.85
153	None	Live	No	B	368583.25	3858996.85
154	None	Live	Yes	B	368583.25	3858996.85
155	None	Live	Yes	C	368594.20	3858994.92
156	None	Live	No	B	368593.22	3858996.82
157	None	Live	No	A	368596.16	3858997.77
158	None	Live	Yes	B	368603.24	3859006.88
159	None	Live	No	B	368603.24	3859006.88
160	None	Live	No	B	368603.24	3859006.88
161	None	Live	Yes	C	368603.24	3859006.88
162	None	Live	No	A	368603.24	3859006.88
163	None	Live	No	A	368603.24	3859006.88
164	None	Live	No	A	368604.22	3858998.88
165	None	Live	Yes	B	368604.22	3858998.88
166	None	Live	Yes	C	368604.22	3858998.88
167	None	Live	No	A	368604.22	3858998.88
168	None	Live	No	B	368616.20	3858979.85
169	None	Live	Yes	B	368604.22	3858998.88
170	None	Live	No	B	368636.19	3858964.92
171	None	Live	No	B	368636.19	3858964.92
172	None	Live	Yes	A	368636.19	3858964.92
173	None	Live	Yes	B	368636.19	3858964.92
174	None	Live	Yes	C	368636.19	3858964.92
175	None	Dead	Yes	B	368636.19	3858964.92
176	None	Live	Yes	B	368636.19	3858964.92
177	None	Live	Yes	B	368636.19	3858964.92
178	None	Live	Yes	B	368563.40	3858853.87
179	None	Live	No	A	368539.11	3858947.55
179	None	Live	No	A	368538.79	3858947.54
181	None	Live	Yes	C	368539.31	3858947.74
182	None	Live	Yes	B	368501.10	3858986.89
183	None	Live	Yes	B	368042.42	3858918.90
184	None	Live	No	B	367882.11	3858894.05

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
185	None	Live	No	B	367882.04	3858893.29
186	None	Live	No	A	367881.09	3858895.45
186	None	Live	No	A	367836.99	3858913.03
187	None	Live	No	B	367837.44	3858913.49
189	None	Live	Yes	B	367838.34	3858913.17
190	None	Live	No	B	367871.20	3858869.27
191	None	Live	Yes	B	367870.24	3858870.14
192	None	Live	No	A	367870.28	3858870.19
193	None	Live	No	A	367871.04	3858867.94
194	None	Live	No	A	367871.15	3858867.98
195	None	Live	No	A	367871.50	3858867.60
196	None	Live	Yes	B	367865.93	3858865.36
197	None	Live	Yes	B	367865.34	3858865.85
198	None	Live	No	A	367864.93	3858863.72
199	None	Live	No	A	367864.89	3858863.43
200	None	Live	Yes	B	367928.11	3858860.79
201	None	Live	Yes	B	367928.41	3858861.54
202	None	Live	No	B	367928.90	3858861.74
203	None	Live	No	A	367928.75	3858861.16
204	None	Live	Yes	C	367950.32	3858870.04
205	None	Dead	Yes	C	367959.33	3858872.38
206	None	Live	No	A	367959.57	3858872.68
207	None	Live	No	B	367959.28	3858872.50
208	None	Live	No	A	367985.64	3858842.46
209	None	Live	No	A	367985.87	3858841.53
210	None	Live	No	A	367985.55	3858841.99
211	None	Live	No	B	367985.35	3858841.87
212	None	Live	No	A	367985.90	3858840.88
213	None	Live	Yes	B	367945.70	3858834.19
214	None	Live	No	A	367945.44	3858834.70
215	None	Live	No	A	367885.14	3858811.70
216	None	Live	No	B	367885.70	3858811.65
217	None	Live	No	A	367884.35	3858810.53
218	None	Live	No	B	367937.90	3858782.20
219	None	Live	No	B	369034.19	3859088.76
220	None	Live	No	A	369034.26	3859088.30
221	None	Live	Yes	C	369034.17	3859087.57
222	None	Live	Yes	B	369032.83	3859088.25
223	None	Live	No	A	369034.14	3859086.67
224	None	Live	No	A	369033.70	3859086.70
225	None	Live	No	A	369038.57	3858937.16
226	None	Live	No	A	369038.67	3858937.30
227	None	Live	No	A	369021.59	3858955.92
228	None	Live	Yes	B	369021.40	3858958.04
229	None	Live	No	A	369021.50	3858958.35
230	None	Live	No	A	369021.38	3858958.92

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
231	None	Live	No	A	369021.46	3858958.74
232	None	Live	No	B	369021.25	3858958.46
233	None	Live	No	A	369021.07	3858958.32
234	Fruit	Live	Yes	B	369019.50	3858957.08
235	None	Live	No	A	369019.74	3858957.03
236	None	Live	No	A	369019.25	3858957.22
237	None	Live	No	A	369018.69	3858956.23
238	None	Live	Yes	B	369018.12	3858958.11
239	None	Live	Yes	B	369019.56	3858959.41
240	None	Live	No	B	369018.66	3858965.15
241	None	Live	No	A	369012.35	3858968.56
242	None	Live	No	B	369012.19	3858968.47
243	None	Live	No	B	369011.84	3858968.36
244	None	Live	Yes	C	368979.33	3859073.68
245	None	Live	Yes	C	369001.29	3859146.56
246	None	Live	No	B	368980.48	3859158.75
247	None	Live	Yes	B	368857.01	3858961.85
248	None	Live	Yes	B	368858.41	3858963.28
249	None	Live	No	B	368699.56	3859011.30
250	None	Live	Yes	B	368699.76	3859011.87
251	None	Live	No	A	368699.43	3859012.17
252	None	Live	No	A	368699.78	3859012.55
253	None	Live	No	A	368700.49	3859012.71
254	None	Live	No	B	368700.70	3859014.05
255	None	Live	No	B	368700.02	3859014.27
256	None	Live	Yes	B	368704.64	3859034.01
257	None	Live	Yes	B	368715.39	3859066.54
258	None	Dead	Yes	B	368707.65	3859073.85
259	None	Live	No	B	368707.22	3859074.82
260	None	Dead	No	A	368709.07	3859075.42
261	None	Live	Yes	B	368719.57	3859101.40
262	None	Live	Yes	B	368742.20	3859211.00
263	None	Dead	Yes	B	368741.96	3859211.80
264	None	Live	No	B	368742.05	3859212.25
265	None	Dead	Yes	B	368745.94	3859210.73
266	None	Dead	Yes	B	368745.81	3859211.56
267	None	Live	No	A	368745.00	3859276.22
268	None	Live	No	A	368744.56	3859277.04
269	None	Live	No	A	368743.77	3859279.50
270	None	Live	Yes	C	368744.83	3859278.49
271	None	Live	Yes	B	368745.11	3859279.79
272	None	Dead	Yes	C	368771.30	3859338.52
273	None	Live	No	A	368772.88	3859277.32
274	None	Live	No	B	368772.60	3859276.19
275	None	Live	No	B	368772.17	3859273.71
276	None	Live	No	B	368772.44	3859273.24

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
277	None	Live	No	B	368774.04	3859272.68
278	Fruit	Live	Yes	B	368776.74	3859273.06
279	None	Live	No	B	368777.26	3859275.23
280	Fruit	Live	Yes	B	368777.65	3859276.93
281	None	Live	Yes	B	368778.19	3859277.83
282	None	Live	No	B	368778.10	3859236.26
283	None	Live	No	B	368778.13	3859237.81
284	None	Live	No	B	368778.45	3859237.73
285	None	Live	No	A	368779.96	3859238.62
286	None	Dead	No	B	368780.94	3859238.16
287	None	Dead	Yes	C	368780.80	3859237.59
288	None	Dead	Yes	B	368777.56	3859236.13
289	None	Dead	Yes	B	368777.74	3859234.65
290	None	Dead	Yes	C	368779.15	3859232.20
291	None	Dead	Yes	C	368784.61	3859232.41
292	None	Live	No	B	368785.68	3859232.86
293	None	Live	Yes	B	368785.51	3859233.30
294	None	Live	Yes	C	368770.87	3859205.60
295	None	Live	No	A	368771.01	3859205.87
296	None	Live	No	A	368770.71	3859205.96
298	None	Live	Yes	B	368771.78	3859204.30
299	Fruit	Live	Yes	B	368768.74	3859204.67
300	None	Live	Yes	B	368768.99	3859206.22
301	None	Live	No	A	368770.74	3859180.20
302	None	Live	Yes	B	368783.64	3859164.04
303	None	Live	No	A	368785.29	3859166.79
304	None	Live	No	B	368786.55	3859166.68
305	None	Live	No	A	368787.07	3859166.71
306	None	Live	No	B	368787.45	3859166.67
307	None	Live	Yes	B	368788.13	3859167.23
308	Fruit	Live	Yes	C	368786.92	3859168.16
309	None	Live	Yes	B	368796.69	3859157.02
310	None	Live	No	B	368796.57	3859156.07
311	Fruit	Live	Yes	C	368797.53	3859156.12
312	None	Live	No	A	368797.33	3859154.72
313	None	Live	No	A	368797.32	3859154.54
314	None	Live	No	B	368798.33	3859153.56
315	None	Live	No	B	368798.72	3859154.12
316	None	Dead	Yes	B	368806.00	3859166.54
317	None	Live	No	B	368805.85	3859166.65
318	None	Live	Yes	C	368805.59	3859167.08
319	None	Live	No	B	368805.81	3859164.74
320	None	Live	No	A	368806.17	3859164.36
321	None	Live	No	B	368806.50	3859163.85
322	None	Live	Yes	C	368806.83	3859163.70
323	None	Live	No	B	368807.90	3859162.56

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
324	None	Live	No	B	368808.60	3859161.86
325	None	Live	No	B	368808.84	3859162.06
326	None	Live	No	B	368808.69	3859162.23
327	None	Dead	Yes	C	368807.85	3859162.65
328	None	Live	No	A	368808.07	3859162.52
329	None	Live	No	A	368809.50	3859161.03
330	None	Live	No	A	368809.77	3859161.19
331	None	Live	No	A	368809.83	3859160.95
332	None	Live	No	A	368810.31	3859160.65
333	None	Live	No	A	368810.06	3859161.72
334	Fruit	Live	No	B	368808.08	3859116.39
335	None	Live	No	A	368809.75	3859116.30
336	None	Live	No	A	368803.24	3859106.55
337	None	Live	No	A	368804.43	3859106.16
338	None	Live	No	A	368803.71	3859105.98
339	None	Live	Yes	B	368803.00	3859106.06
340	None	Live	No	B	368784.36	3859076.36
341	None	Live	No	B	368784.21	3859070.73
342	None	Live	Yes	B	368815.68	3859024.87
343	None	Live	No	A	368816.80	3859025.55
345	None	Live	Yes	C	368799.98	3859038.88
346	None	Live	No	B	368842.13	3859114.38
347	None	Live	No	B	368835.05	3859133.93
347	None	Live	No	B	368845.54	3859176.52
348	None	Live	No	A	368846.09	3859177.70
349	None	Live	No	B	368847.19	3859175.56
350	None	Live	Yes	B	368847.17	3859176.38
351	None	Live	No	B	368848.38	3859176.24
352	None	Live	No	A	368849.18	3859176.06
353	None	Live	No	A	368850.15	3859175.84
354	None	Live	No	B	368850.25	3859175.90
355	None	Live	No	B	368826.46	3859227.01
356	None	Live	Yes	C	368826.41	3859226.64
357	None	Live	Yes	B	368813.03	3859262.20
358	None	Dead	Yes	B	368817.54	3859287.07
359	None	Live	No	B	368818.57	3859286.80
360	None	Live	No	B	368819.24	3859286.15
361	None	Live	No	B	368819.10	3859287.45
362	None	Live	No	A	368819.32	3859288.30
363	None	Live	No	B	368818.73	3859288.10
364	None	Live	No	B	368820.99	3859287.31
365	None	Live	No	B	368820.23	3859286.76
366	None	Live	Yes	B	368823.16	3859350.87
367	None	Live	No	A	368840.71	3859353.96
368	None	Live	Yes	B	368840.06	3859353.97
369	None	Live	No	A	368841.05	3859354.65

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
370	None	Live	No	B	368843.02	3859354.29
371	None	Live	No	A	368839.18	3859343.69
372	None	Live	No	B	368845.04	3859332.40
373	None	Live	No	B	368864.42	3859320.99
374	None	Live	No	B	368858.66	3859285.22
375	None	Live	No	A	368859.76	3859284.83
376	None	Live	No	B	368845.28	3859285.40
377	None	Live	No	B	368891.28	3859217.35
378	None	Live	No	B	368900.39	3859164.34
379	None	Live	No	A	368899.85	3859164.61
380	None	Live	Yes	B	368899.99	3859164.14
381	None	Live	Yes	B	368899.90	3859163.01
382	None	Live	No	A	368899.34	3859162.71
383	None	Live	No	A	368899.86	3859163.27
383	None	Live	No	B	368871.03	3859117.09
384	None	Live	No	B	368870.60	3859117.69
385	None	Live	No	B	368868.76	3859117.39
386	None	Live	No	A	368868.65	3859116.74
387	None	Live	No	B	368852.67	3858981.82
388	None	Live	No	B	368880.76	3859058.22
389	None	Live	No	B	368947.46	3859180.69
390	None	Live	No	B	368947.96	3859180.92
392	None	Live	No	B	368947.51	3859183.20
393	None	Live	No	A	368947.40	3859183.43
394	None	Live	No	B	368945.96	3859181.73
395	None	Live	Yes	B	368945.97	3859181.46
396	None	Live	No	B	368884.12	3859266.52
397	None	Dead	Yes	B	368883.60	3859266.82
398	None	Live	No	B	368880.53	3859307.07
399	None	Dead	No	B	368880.32	3859307.25
400	None	Live	No	A	368910.20	3859331.98
401	None	Live	No	B	368913.97	3859356.08
402	None	Live	Yes	B	368914.27	3859356.08
403	None	Live	No	B	368921.39	3859350.10
404	None	Live	No	B	368948.87	3859350.88
405	None	Live	No	A	368941.52	3859333.30
406	None	Live	No	A	368943.41	3859332.26
407	None	Live	No	A	368943.55	3859332.20
408	None	Live	No	A	368943.93	3859332.04
409	None	Live	No	B	368943.72	3859331.17
410	None	Live	Yes	B	368943.14	3859331.51
411	None	Live	No	A	368942.74	3859330.78
412	None	Live	No	A	368942.77	3859331.18
413	None	Live	Yes	B	368938.58	3859261.40
414	None	Live	No	B	368976.45	3859314.41
415	None	Live	No	B	368976.40	3859315.28

Tree ID	Phenology	Live or Dead	Mature (Branched)	Height Class	Easting NAD83 UTM Zone 11	NorthingNAD83 UTM Zone 11
416	None	Live	No	B	368995.60	3859267.91
417	None	Dead	Yes	B	369014.21	3859237.11
418	None	Dead	Yes	C	369014.23	3859237.66

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Yucaipa, CA 92399
(909) 534-4547
www.jennings-environmental.com

February 26, 2026

TRC Solutions, Inc.
6 Executive Circle, Suite 200
Irvine, CA 92614

RE: WESTERN JOSHUA TREE CENSUS FOR THE EUISMOD PROJECT TIELINES ALIGNMENT, IN THE UNINCORPORATED KERN COUNTY, CALIFORNIA

Dear TRC Solutions, Inc.,

Jennings Environmental was retained by TRC Solutions, Inc., to assess the effect of the proposed Eusimod Project Tielines Alignment (Project) as it relates to western Joshua trees (WJT). The purpose of this assessment is to determine if the proposed alignment would have a negative impact on any western Joshua trees.

Project Description and Location

The survey area is generally located in Section 14, Township 9 North, Range 15 West, and is depicted on the *Fairmont Butte* U.S. Geological Survey's (USGS) 7.5-minute topographic map, within unincorporated Kern County, California (Figures 1 and 2 in Appendix A). The WJT assessment within the Tieline Alignment was limited to the alignment and a 50-foot buffer on either site of the alignment.

Western Joshua Tree (*Yucca brevifolia*)

Western Joshua trees occur throughout the Mojave Desert in Southern California and are typically found at an elevation of 400 to 1,800 meters (~1,200 to ~5,400 feet). Western Joshua trees within the western portion of the Mojave Desert typically receive more annual precipitation during "normal" years; consequently, cloning occurs more often resulting in numerous trunks sprouting from the same root system. Western Joshua tree habitats provide habitat for a variety of wildlife species including desert woodrats *(Neotoma* sp.) and night lizards *(Xantusia* sp.) both of which utilize the base of the trees. A variety of birds also utilize Western Joshua trees for nesting such as hawks, common ravens, and cactus wrens. CDFW considers Western Joshua tree woodlands as areas that support relatively high species diversity and as such are considered to be a sensitive desert community. Western Joshua trees are also considered a significant resource under the California Environmental Quality Act (CEQA) and are included in the Desert Plant Protection Act, Food and Agricultural Code (80001 - 80006).

Additionally, pursuant to the provisions of Section 2074.2 of the Fish and Game Code, the California Fish and Game Commission (Commission), at its September 22, 2020, meeting, accepted for consideration the petition submitted to list the western Joshua tree (*Yucca brevifolia*) as threatened or endangered under the California Endangered Species Act. Based on that finding and the acceptance of the petition, the

Commission also provided notice that the western Joshua tree is a candidate species as defined by Section 2068 of the Fish and Game Code.

Western Joshua Tree Conservation Act

The Western Joshua Tree Conservation Act (WJTCA) was passed in July 2023 to conserve the western Joshua tree and its habitat while supporting the state's renewable energy and housing priorities. The WJTCA creates a streamlined permitting framework for certain development activities and collects mitigation fees for the acquisition and conservation of western Joshua tree habitat and other actions to conserve western Joshua trees. This will offset the impacts of permitted projects that negatively impact western Joshua trees and help to conserve the species on a landscape scale.

Permitting

The WJTCA authorizes the CDFW to:

- Permit the trimming and removal of hazardous or dead western Joshua trees.
- Permit the incidental take of western Joshua trees provided the permittee meets certain conditions.
- Enter into an agreement with a county or city to delegate limited authority to issue the permits mentioned above, provided certain conditions are met.

Additionally, the WJTCA directs CDFW to develop a conservation plan for western Joshua tree by the July 2024. The Western Joshua Tree Conservation Plan was approved by the Fish and Game Commission in August 2025.

Biologist Qualifications and Survey Conditions

Jennings biologist, Gene Jennings, conducted the western Joshua tree Census within the Project site and surrounding buffer. Mr. Jennings is the Principal and Regulatory Specialist for Jennings Environmental, LLC. He has a Bachelor of Science degree in Biology from Cal State San Bernardino and has over 12 years of experience in the handling and removal of native desert plants. The survey was conducted on foot, throughout the Project site, on February 25, 2025.

Results

The survey was negative for any WJT within the Alignment or the buffer area. Therefore, no impacts are anticipated to occur to WJT within Tieline alignments as proposed**.**

Conclusions and Recommendations

There are currently no WJTs within the Alignment or buffer area. A western Joshua tree take permit will not be required.

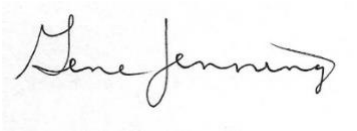
Certification

I hereby certify that the statements furnished herein, and in the attached exhibits present data and information required for this analysis to the best of my ability, and the facts, statements, and information

presented are true and correct to the best of my knowledge and belief. This report was prepared in accordance with professional requirements and standards. Fieldwork conducted for this assessment was performed by me. I certify that I have not signed a non-disclosure or consultant confidentiality agreement with the project proponent and that I have no financial interest in the project.

Please do not hesitate to contact me at 909-534-4547 should you have any questions or require further information.

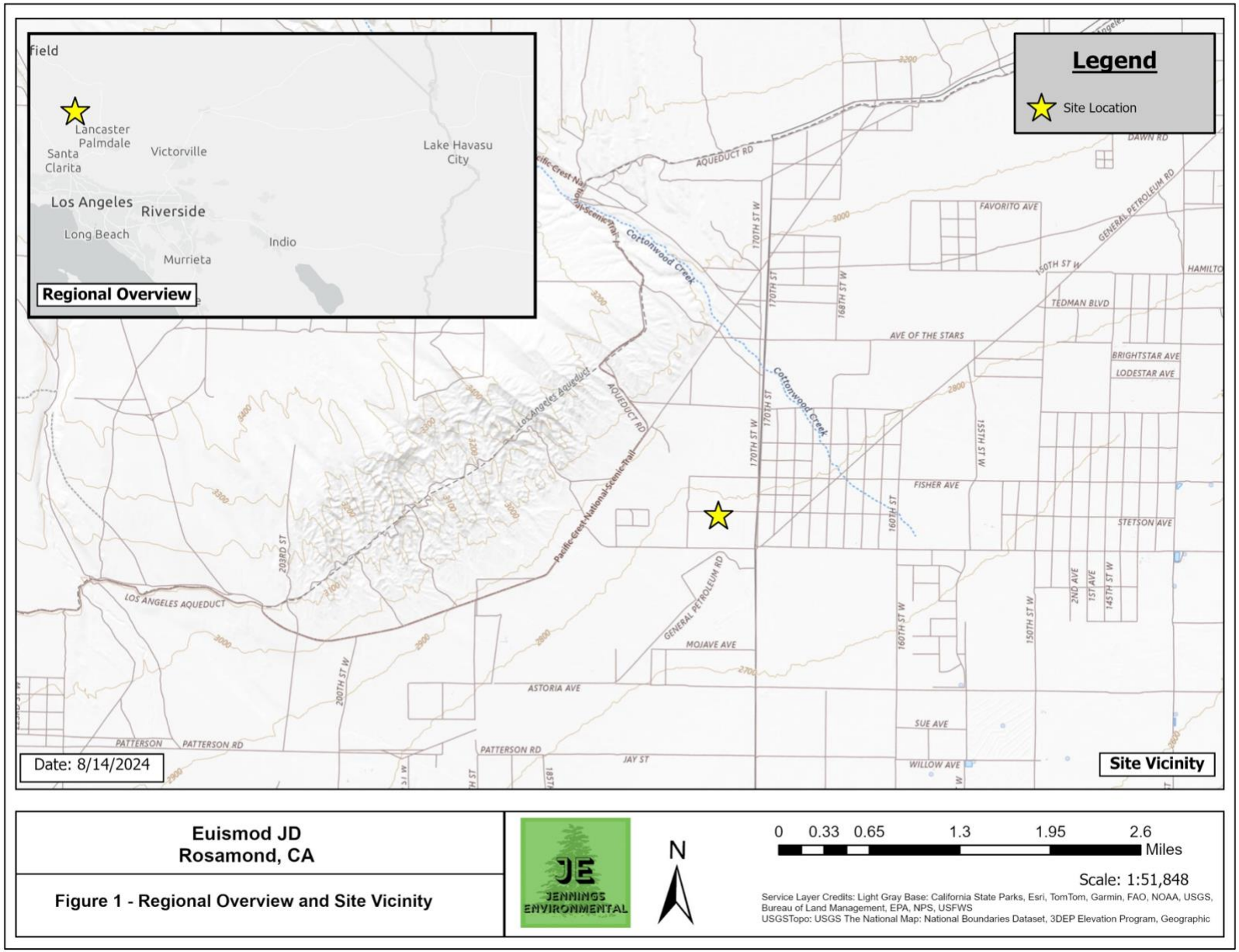
Sincerely,

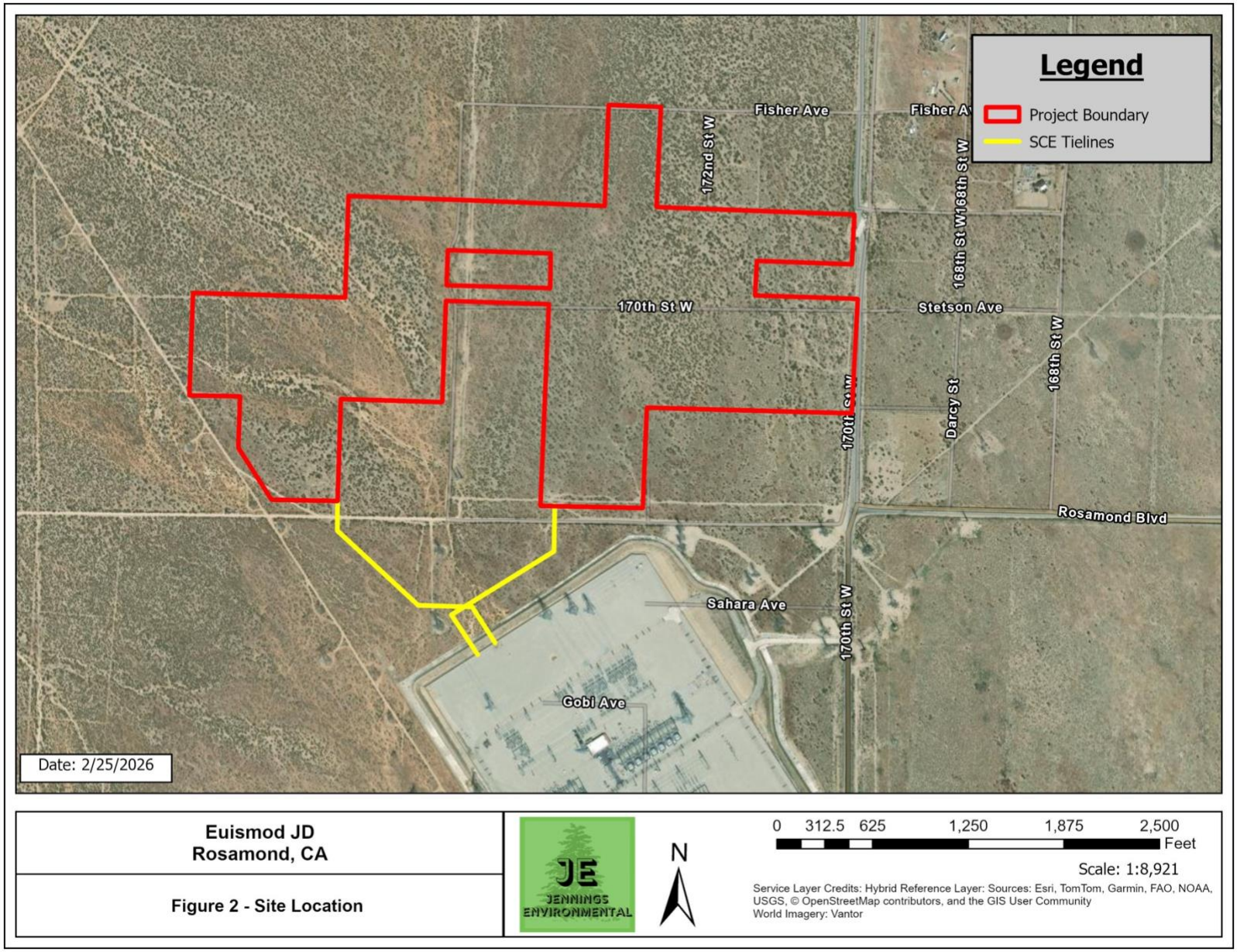


Gene Jennings
Principal/Regulatory Specialist

Attachments:
Attachment A – Figures

Attachment A - Figures


Legend
Site Location
Regional Overview
Field
Lancaster
Palmdale
Victorville
Santa Clarita
Lake Havasu City
Los Angeles
Riverside
Long Beach
Indio
Murrieta
Date: 8/14/2024
Site Vicinity
AQUEDUCT RD
FAVORITO AVE
GENERAL PETROLEUM RD
DAWN RD
TEDMAN BLVD
AVE OF THE STARS
BRIGHTSTAR AVE
LODESTAR AVE
FISHER AVE
STETSON AVE
MOJAVE AVE
ASTORIA AVE
SUE AVE
WILLOW AVE
JAY ST
PATTERSON RD
LOS ANGELES AQUEDUCT
Pacific Crest National Scenic Trail
Cottonwood Creek
Euismod JD
Rosamond, CA
Figure 1 - Regional Overview and Site Vicinity
JE
JENNINGS ENVIRONMENTAL
N
0 0.33 0.65 1.3 1.95 2.6
Miles
Scale: 1:51,848
Service Layer Credits: Light Gray Base: California State Parks, Esri, TomTom, Garmin, FAO, NOAA, USGS, Bureau of Land Management, EPA, NPS, USFWS
USGSTopo: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic


Legend
Project Boundary
SCE Tielines
Fisher Ave
172nd St W
168th St W
170th St W
Stetson Ave
Darcy St
Rosamond Blvd
Sahara Ave
Gobi Ave
Date: 2/25/2026
Euismod JD
Rosamond, CA
Figure 2 - Site Location
JE
JENNINGS ENVIRONMENTAL
N
0 312.5 625 1,250 1,875 2,500
Feet
Scale: 1:8,921
Service Layer Credits: Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Imagery: Vantor

Appendix C9
Jurisdictional Waters Delineation Report

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JURISDICTIONAL DELINEATION OF PARCELS 261-104-10, -12, -13, -16, -17, -19, -20, -21, 261-103-17, -20, -21, AND -29, IN UNINCORPORATED KERN COUNTY, CALIFORNIA

Prepared for:

TRC Solutions, Inc.
6 Executive Circle, Suite 200
Irvine, CA 92614

On Behalf of:

Mountainview Biological Consulting
27890 Clinton Keith Rd, Ste D240
Murrieta, CA 92562

Prepared by:

Jennings Environmental, LLC
35414 Acacia Ave.
Yucaipa, CA 92399
909-534-4547

August 2024, Updated February 2026

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EXECUTIVE SUMMARY

Jennings Environmental (Jennings) has prepared this Delineation of State and Federal Jurisdictional Waters Report for the Proposed Development on Assessor Parcel Numbers (APNs) 261-104-10, -13, -16, -19, -20, -21, 261-103-17, -20, -21, and -29, and the southernmost 100 feet of APNs 261-104-12 and -17, (Project site or site) located in unincorporated Kern County, California. The jurisdictional delineation documents the regulatory authority of the U.S. Army Corps of Engineers (Corps), the Regional Water Quality Control Board (Regional Board), and the California Department of Fish and Wildlife (CDFW) pursuant to Section 401 and 404 of the Federal Clean Water Act (CWA), the California Porter-Cologne Water Quality Control Act, and Sections 1600 *et. seq.* of the California Fish and Game Code.

Eight (8) unnamed ephemeral drainage features (Drainages 1-8) were observed within the boundaries of the survey area during the field delineation. These drainage features generally flow from the west and north of the site to toward the southeast. The drainages only convey surface flow in direct response to precipitation and do not support riparian vegetation.

The observed ephemeral drainage features are not relatively permanent, standing, or continuously flowing bodies of water and, therefore, will not qualify as waters of the United States under the regulatory authority of the United States Army Corps of Engineers (Corps) (*Sackett v. EPA* (2022) 143 S. Ct. 1322, 1336). However, the observed drainage features will qualify as waters of the State and fall under the regulatory authority of the Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Wildlife (CDFW). Section 3.2.1 details the extent of each agency's jurisdiction.

SECTION 1.0 – INTRODUCTION

Jennings Environmental, LLC (Jennings) was retained by Mountainview Biological Consulting (MVBC) to conduct a survey for any drainage features that would meet the definition of the Waters of the US (WOTUS), Waters of the State (WOS), or CDFW jurisdiction.

1.1 SITE LOCATION

The delineation area is generally located in Section 14, Township 9 North, Range 15 West, and is depicted on the *Fairmont Butte* U.S. Geological Survey's (USGS) 7.5-minute topographic map. More specifically the delineation area encompasses all of Assessor Parcel Numbers (APNs) 261-104-10, -13, -16, -19, -20, -21, 261-103-17, -20, -21, and -29, and the southernmost 100 feet of APNs 261-104-12 and -17, within unincorporated Kern County, California (Figures 1 and 2 in Appendix A). The 10 APNs included in entirety are planned for potential Project development and the 100 foot wide corridors in APNs 261-104-12 and -17 were considered as a possible alternative access route for the Project.

1.2 PROJECT DESCRIPTION

The proposed Project is to develop the site with a Battery Energy Storage System. Including access roads, associated structures, , and facilities. Additionally, the Project includes two tielines to an existing Southern California Edison Facility. These will be overhead high voltage tielines that will require access and may require redundant underground communication lines, likely using open trenches.

SECTION 2.0 – METHODOLOGY

2.1 SURVEY METHODS

On July 24, 2024 and again on February 25, 2026, Mr. Jennings from Jennings Environmental evaluated the Project area for the presence of riverine/riparian/wetland habitat and jurisdictional waters, i.e. Waters of the U.S. (WOTUS), as regulated by the USACE, WOS as regulated by RWQCB, and/or jurisdictional streambed, and/or jurisdictional streambed and associated riparian habitat as regulated by the CDFW. The surveys were conducted on foot and all limits were mapped using sub-meter GPS. Prior to the field visit, aerial photographs of the Project area were viewed and compared with the surrounding USGS 7.5-Minute Topographic Quadrangle maps to identify drainage features within the survey area as indicated from topographic changes, blue-line features, or visible drainage patterns. The USFWS National Wetland Inventory and Environmental Protection Agency (EPA) Water Program "My Waters" Google Earth Pro data layer were also reviewed to determine whether any hydrologic features and wetland areas had been documented within the vicinity of the site. Similarly, the United States Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) Web Soil Survey was reviewed for soil types found within the Project Area to identify the soil series in the area and to check these soils to determine whether they are regionally identified as hydric soils. Upstream and downstream connectivity of waterways (if present) were reviewed on Google Earth Pro aerial photographs and topographic maps to determine jurisdictional status. The lateral extent of potential USACE jurisdiction was measured at the Ordinary High Watermark (OHWM) in accordance with regulations set forth in 33CFR part 328 and the USACE guidance documents listed below:

- *USACE Wetlands Research Program Technical Report Y-87-1 (on-line edition), Wetlands Delineation Manual, Environmental Laboratory, 1987 (Wetland Delineation Manual).*
- *USACE Minimum Standards for Acceptance of Preliminary Wetlands Delineations, November 30, 2001 (Minimum Standards).*
- *USACE Jurisdictional Determination Form Instructional Guidebook, May 30, 2007 (JD Form Guidebook).*
- *USACE Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), May 2010.*
- *USACE A Guide to Ordinary High-Water Mark (OHWM) Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States, August 2014 (Delineation Manual).*

2.2 JURISDICTIONAL FEATURES

A general assessment of jurisdictional waters regulated by the USACE, RWQCB, and CDFW was conducted for the proposed Project area. Pursuant to Section 404 of the Clean Water Act, USACE regulates the discharge of dredged and/or fill material into waters of the United States. The State of California (State) regulates the discharge of material into waters of the State pursuant to Section 401 of the Clean Water Act and the California Porter- Cologne Water Quality Control Act (California Water Code, Division 7, §13000 et seq.). Pursuant to Division 2, Chapter 6, Sections 1600-1602 of the California Fish and Game Code, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake, which supports fish or wildlife. The assessment was conducted by a desktop

survey through the USGS National Hydrography Dataset for hydrological connectivity. Additional discussion of the regulatory framework is provided in Appendix C.

To be considered a jurisdictional wetland under Section 404, an area must possess three wetland characteristics: hydrophytic vegetation, hydric soils, and wetland hydrology.

Hydrophytic vegetation

Hydrophytic (wetland) vegetation is plant life that grows, and is typically adapted for life, in permanently or periodically saturated soils. The hydrophytic vegetation criterion is met if more than 50 percent of the dominant plant species from all strata (tree, shrub, and herb layers) is considered hydrophytic. Hydrophytic species are those included on the 2016 National Wetland Plant List (Arid West Region) (Lichvar, 2016). Each species on the list is rated according to a wetland indicator category, as shown in Table 1. To be considered hydrophytic, the species must have wetland indicator status, i.e., be rated as Obligate Wetland (OBL), Facultative Wetland (FACW) or Facultative (FAC).

Table 1
Wetland Indicator Vegetation Categories

Obligate Wetland (OBL)	Almost always occur in wetlands (estimated probability >99%)
Facultative Wetland (FACW)	Usually occur in wetlands (estimated probability 67 to 99%)
Facultative (FAC)	Equally likely to occur in wetlands and non-wetlands (estimated probability 34 to 66%)
Facultative Upland (FACU)	Usually occur in non-wetlands (estimated probability 67 to 99%)
Obligate Upland (UPL)	Almost always occur in non-wetlands (estimated probability >99%)

Hydric Soil

Hydric soils are saturated or inundated long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. Generally, hydric soils are dark in color resulting from soil development under anoxic (without oxygen) conditions. Bright mottles within an otherwise dark soil matrix indicate periodic saturation with intervening periods of soil aeration. Generally, the hydric soil criterion is satisfied at a location if soils in the area can be inferred or observed to have a high groundwater table if there is evidence of prolonged soil saturation, or if there are indicators suggesting a long-term reducing environment in the upper part of the soil profile. Typically, reducing conditions are most easily assessed using soil color.

- Color characteristics (Hue, Value, and Chroma) were recorded using a standard Munsell soil color chart (Munsell Color 2009).
- Soil physical characteristics were evaluated during the field delineations by excavating to a depth needed to evaluate potential hydric soil indicators below ground surface 18-24 inches.

- Soils that exhibited hydric soil indicators, such as low chroma colors and/or evidence of reducing conditions met the hydric soil criterion per USACE (1987 and 2012).

The Arid West Supplement provides a list of 23 hydric soil indicators known to occur in the Arid West region. Hydric soils are present at any sample plot where the soil samples meet one or more of those 23 hydric indicators. As set forth in the Arid West Supplement (2008), some wetlands can be difficult to identify because wetland indicators, including those relating to soils, may be missing due to natural processes or recent disturbances. As set forth on Page 97 of the Arid West Supplement, sand, and gravel bars within floodplains can be problematic because they may lack hydric indicators due to seasonal and annual depositions, resulting in sandy substrates that are low in iron and manganese content and have low organic matter content.

Wetland Hydrology

Hydrology (water depth, extent of inundation, period of inundation) determines all other wetland characteristics. Federal Regulation 33 CFR 328.3(b) defines "wetlands" as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." According to the Corps' 1987 Wetland Delineation Manual, the primary hydrologic test to determine soil saturation was whether the area's water table rises to within 18 inches of the surface for seven consecutive days during the growing season (February-June). Seasonal and long-term rainfall patterns, local geology and topography, soil type, local water table conditions, and drainage are factors that control hydrology. Wetland hydrology indicators include surface water, high water tables, saturation, watermarks, sediment deposits, drift deposits, surface soil cracks, inundation visible on aerial imagery, water-stained leaves, salt crusts, biotic crusts, aquatic invertebrates, hydrogen sulfide odor, oxidized rhizospheres along living roots, the presence of iron reduction in tilled soils, thin muck surfaces, drainage patterns, crayfish burrows, and shallow aquitards.

Regional Water Quality Board

The California Porter-Cologne Water Quality Control Act gives the Regional Board very broad authority to regulate waters of the State, which are defined as any surface water or groundwater, including saline waters. The Regional Board shares the Corps' methodology for delineating the limits of jurisdiction based on the identification of OHWM indicators and utilizing the three parameter approach for wetlands.

California Department of Fish and Wildlife

Sections 1600 et seq. of the California Fish and Game Code applies to all perennial, intermittent, and ephemeral rivers, streams, and lakes in the State. CDFW Regulations define "stream" as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and that supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation." (14 Cal. Code Regs., § 1.72.) For this Project location, CDFW jurisdictional limits were delineated using this definition of "stream.".

SECTION 3.0 – RESULTS

3.1 LITERATURE REVIEW RESULTS

3.1.1 JURISDICTIONAL WATERS

Aerial imagery of the site was examined and compared with the surrounding USGS 7.5-minute topographic quadrangle maps to identify drainage features within the survey area as indicated from topographic changes, blue-line features, or visible drainage patterns.

After review of the aerials, it appeared that there are some potential drainage features within the survey area. The drainages identified through aerial photographs were targeted for the focus of field studies. Additionally, it was determined that the site is located within the Antelope Valley Area, California area CA675. The Project contains three (3) soil types (Figure 3 in Appendix A):

Cajon loamy sand, 2 to 9 percent slopes (CaC). This soil is excessively drained with a high to very high capacity to transmit water. This soil consists of alluvium derived from granite, typically ranges in elevation between 400 to 4,000 feet above mean sea level (amsl), and is considered prime farmland if irrigated.

Hesperia fine sandy loam, 2 to 5 percent slopes (HkB). This soil is well drained with a high capacity to transmit water. This soil consists of alluvium derived from granite, typically ranges in elevation between 200 to 4,000 feet amsl, and is considered prime farmland if irrigated.

Rosamond fine sandy loam (Ro). This soil is well drained with a moderately high to high capacity to transmit water. This soil consists of alluvium derived from granite, typically ranges in elevation between 1,900 to 3,360 feet amsl, and is considered prime farmland if irrigated.

None of the soils found within the survey area are classified as Hydric Soils under the State Soils Data Access Hydric Soils List.

3.1.2 HYDROLOGY AND HYDROLOGIC CONNECTIVITY

Hydrologically, the Project is located within an undefined Hydrologic Sub-Area (HSA 626.40), as identified on the Calwater Watershed maps. This undefined HSA comprises a 194,724-acre drainage area within the larger Sacatara Creek-Kings Canyon Watershed Area (Hydrologic Unit Code [HUC10] 180902061, US Watershed Maps) (CalTrans, 2024). The Sacatara Creek-Kings Canyon watershed in the Project area is bordered to the north by the Cottonwood Creek-Tylerhorse Canyon, El Paso Creek, and Loveoak Canyon-Pastoria Creek watersheds, to the east by the Rosamond Lake watershed, to the south by the Amargosa Creek and Castaic Creek watersheds, and to the west by the Grapevine Creek and Upper Piru Creek watersheds. (Figure 4 in Appendix A).

Flows from ephemeral drainages appear to originate off-site and flow in a southeast to south direction across the site. They then meet the existing rip-rap barrier at the Southern California Edison Whirlwind Sub-Station. They then proceed southwest along that barrier and into engineered drainage controls associated with the Whirlwind Substation.

3.2 FIELD STUDY RESULTS

3.2.1 JURISDICTIONAL WATERS

Waters of the United States

The USACE has the authority to permit the discharge of dredged or fill material in the Waters of the United States (WOTUS) under Section 404 CWA. None of the drainage features meet the definition for WOTUS as defined in the CWA. The ephemeral drainage features are not relatively permanent, standing, or continuously flowing bodies of water. For these reasons, drainage features on the site and tieline areas will not qualify as waters of the United States under the regulatory authority of the Corps (*Sackett v. EPA* (2023) 143 S. Ct. 1322, 1336).

Wetlands

In order to qualify as a wetland, a feature must exhibit all three wetland parameters (i.e., vegetation, soils, and hydrology) described in the Corps Arid West Regional Supplement. Although evidence of hydrology (i.e., scour, changes in substrate, shelving) was present within the drainages, these areas were dominated by upland plant species. Further, water does not persist long enough in the drainages to create hydric soil (anaerobic) conditions, and none of the on-site drainages supported a dominance of hydrophytic vegetation. As a result, no features meet the Corps' or Regional Board's wetland definition to qualify as jurisdictional wetlands.

Waters of the State

The project is within the jurisdiction of the Lahontan Regional Water Quality Control Board (RWQCB). Beneficial uses of the drainage features waters including municipal and domestic supply, groundwater recharge, and wildlife habitat. All are considered intermittent beneficial uses (RWQCB, 1994). None of the waters within the project area are listed as impaired by the State Water Resources Control Board (SWRCB, 2024).

The Lahontan Regional Water Quality Board has authority over the discharge of dredged or fill material in Waters of the State (WOS) under Section 401 CWA as well as the Porter-Cologne Water Quality Control Act. This act gives the State Water Board, under the authority of its' Regional Boards, very broad authority to regulate waters of the State, which are defined as any surface water or groundwater, including ephemeral drainages and saline water. All drainage features were identified in the delineation area that meet the definition of WOS under the Porter-Cologne Water Quality Act. Table 1 below details the jurisdictional extent of the WOS on-site (Figure 5 in Appendix A).

The Drainage Features within the survey area are generally ephemeral depositional channels with sandy bottoms, low sandy banks, and vegetation consistent with the upland surroundings. Typical bed and bank conditions are evident in the Photographs in Appendix B.

Fish and Game Code Section 1602 - State Lake and/or Streambed

The CDFW asserts jurisdiction over any drainage feature that contains a definable bed and bank or associated riparian vegetation. The Project area was surveyed with 100 percent visual coverage and the

on-site drainages are considered jurisdictional under CDFW. Table 1 below details the extent of CDFW jurisdiction within the channel (Figure 6 in Appendix A).

CDFW's jurisdiction often extends well beyond the OHWM defining WOS. For the Project site, the greatest difference occurs at Drainage Feature 1 where the sheet flow has occasionally escaped the limits of the low flow channel. This creates what is classified a Paleo or Historical Channel. A Paleo Channel is not considered jurisdictional under WOS but is considered jurisdictional under Fish and Game Code. staff.

Table 1 – Jurisdiction Areas

Feature	Maximum Bank-Full width (feet)	Length (feet)	Max Channels Depth (inches)	Regional Board jurisdiction {WOS} (acres)	CDFW jurisdiction (acres)
Drainage Feature 1	22	1,194	6	0.11	2.53
Drainage Feature 2	11	301	4	0.02	0.13
Drainage Feature 3	21	613	4	0.04	0.15
Drainage Feature 4	395	280	2	0.71	1.19
Drainage Feature 5	8	127	1	0.03	0.03
Drainage Feature 6	4	337	1	0.07	0.08
Drainage Feature 7	2	313	2	0.05	0.05
Drainage Feature 8	25	102	6	0.03	0.03
			Total	1.06	4.19

Section 4.0 – CONCLUSIONS AND RECOMMENDATIONS

4.1 JURISDICTIONAL AREAS

All Drainage Features within the survey area do meet the definitions of "Waters of the State" as described in the Porter-Cologne Water Quality Act under the jurisdiction of the Regional Water Quality Control Board (RWQCB) and Section 1600 of the State of California Fish and Game Code (FGC) under the jurisdiction of the CDFW. Therefore, any impacts to the drainages will require a Waste Discharge Requirement (WDR) permit from the RWCQB and a 1602 Lake and Streambed Alteration Agreement from CDFW.

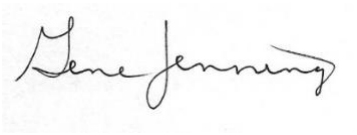
4.2 CERTIFICATION

I hereby certify that the statements furnished herein, and in the attached exhibits present data and information required for this analysis to the best of my ability, and the facts, statements, and information presented are true and correct to the best of my knowledge and belief. This report was prepared in accordance with professional requirements and standards. Fieldwork conducted for this assessment was

performed by me. I certify that I have not signed a non-disclosure or consultant confidentiality agreement with the project proponent and that I have no financial interest in the project.

Please do not hesitate to contact me at 909-534-4547 should you have any questions or require further information.

Sincerely,



Gene Jennings
Principal/Regulatory Specialist
Appendices:

- Appendix A – Figures
- Appendix B – Site Photos
- Appendix C – Regulatory Framework
- Appendix D – OHWM Datasheets

Section 5 – REFERENCES

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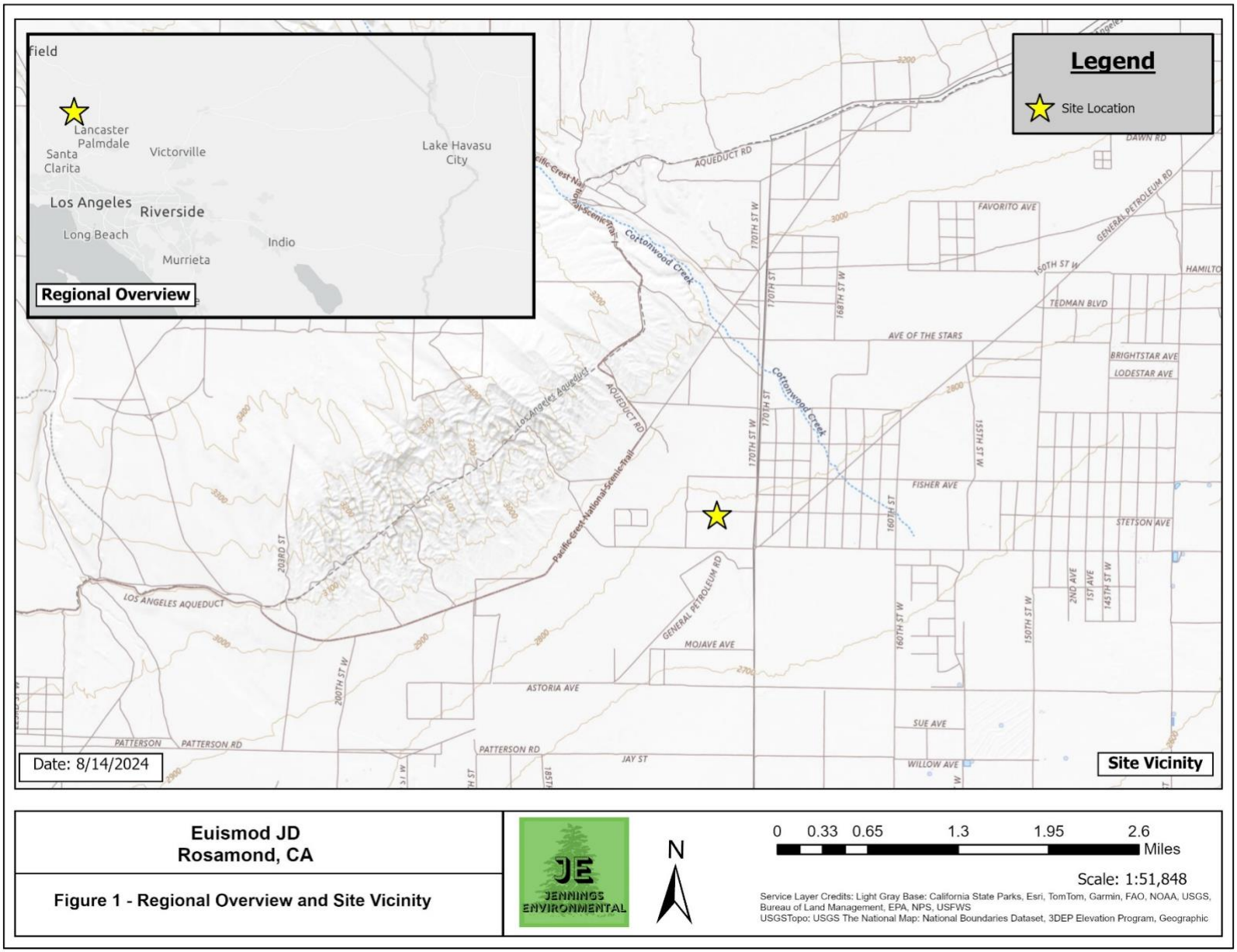
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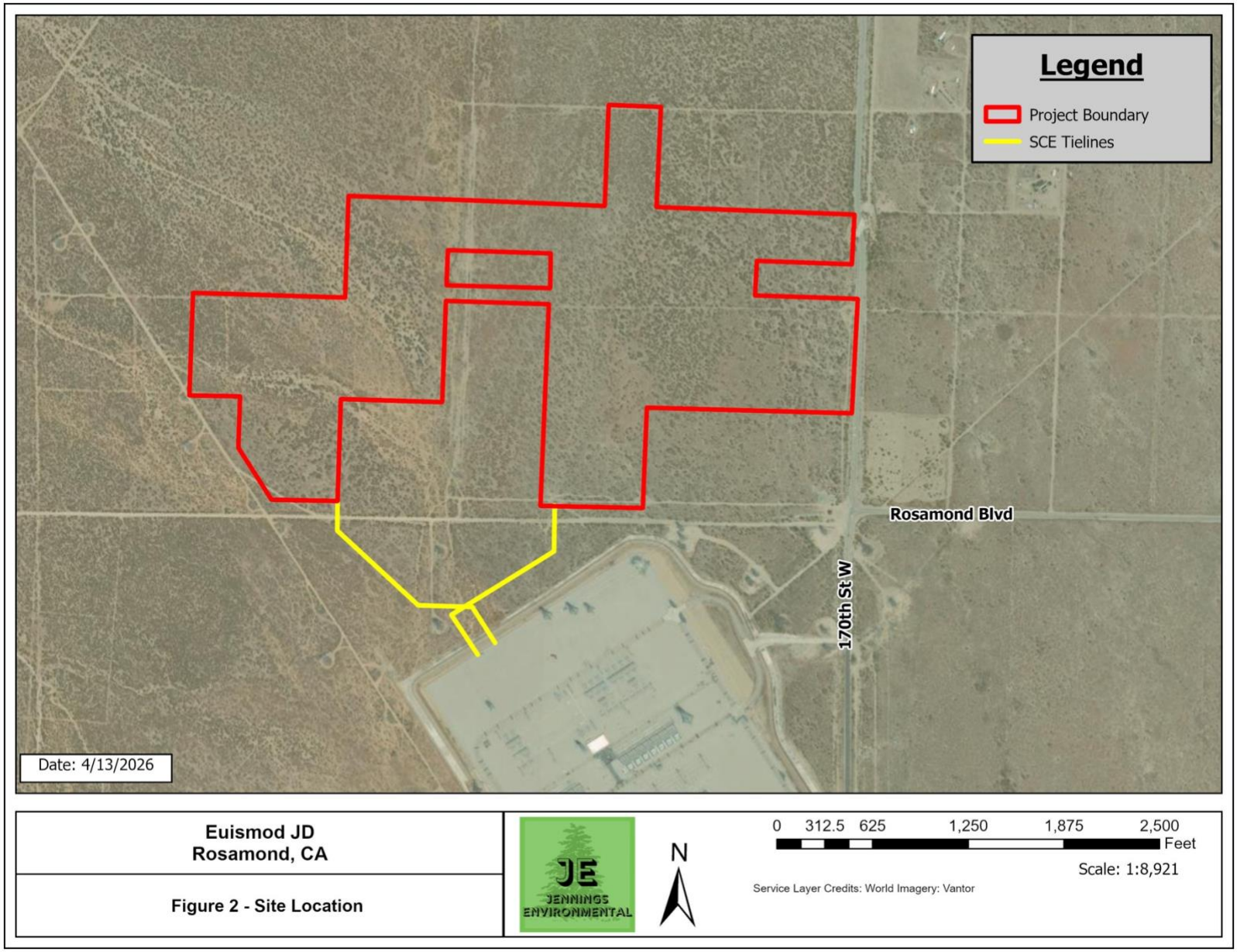
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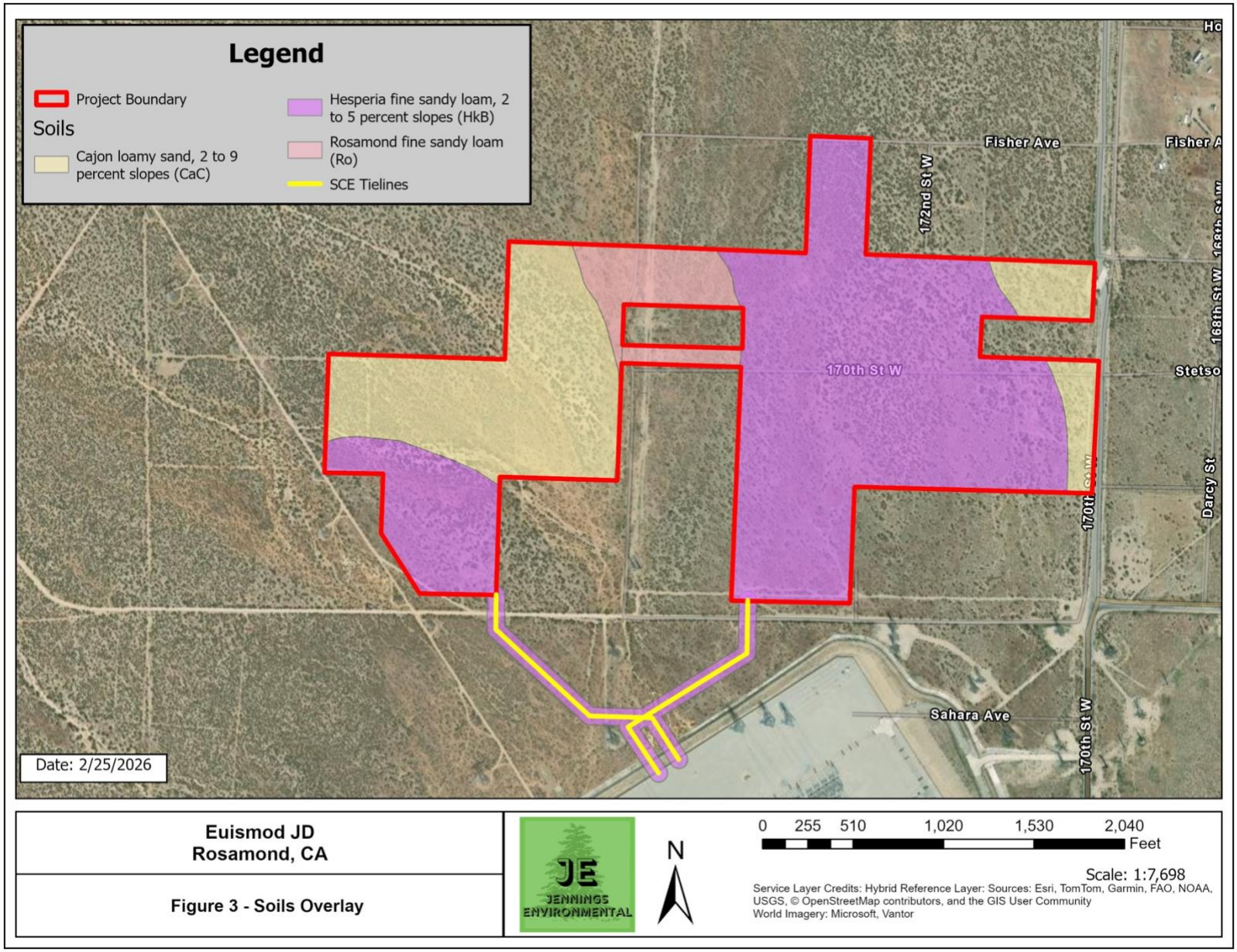
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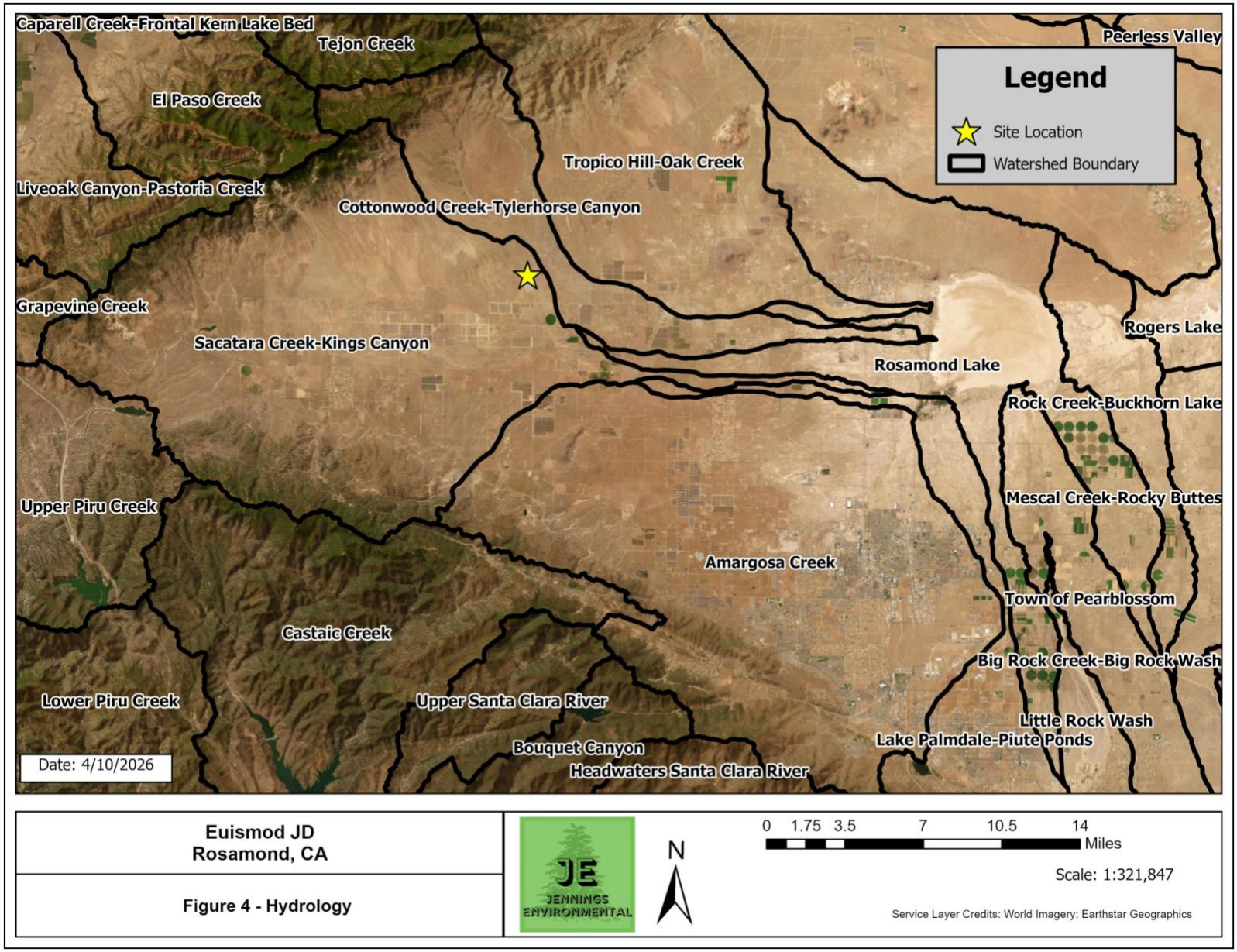
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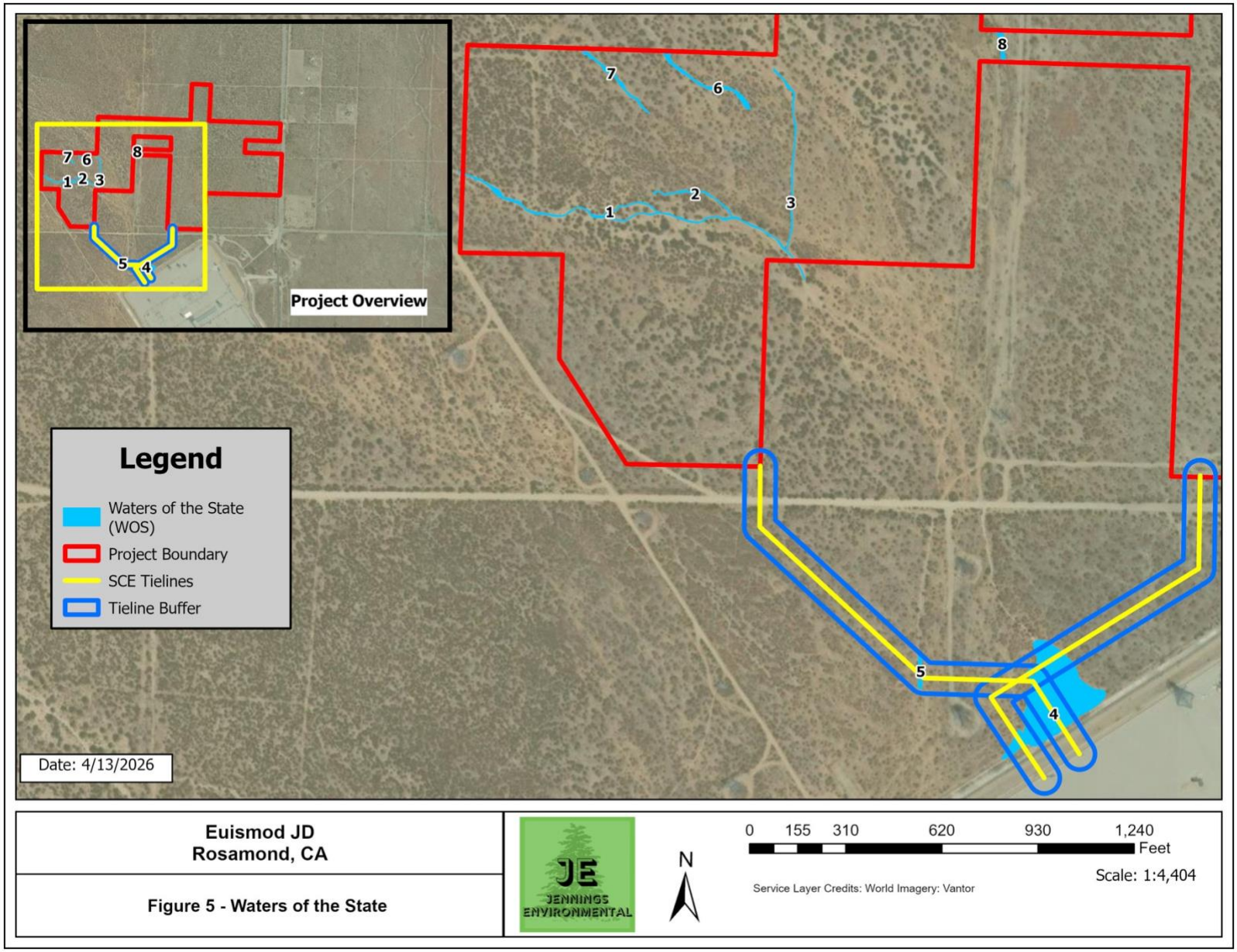
Appendix A - Figures

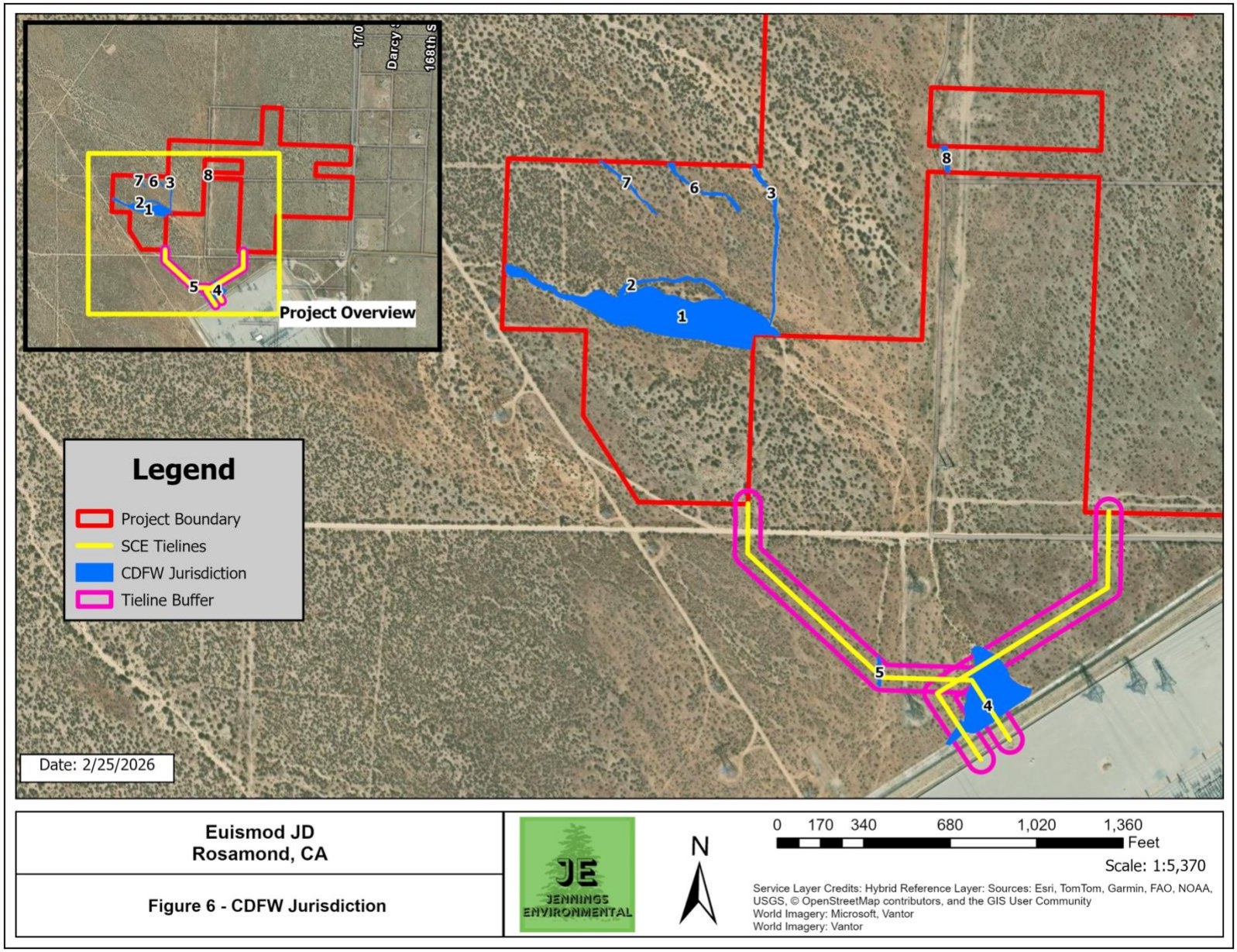

Legend
Site Location
Regional Overview
Field
Lancaster
Palmdale
Santa Clarita
Victorville
Lake Havasu City
Los Angeles
Riverside
Long Beach
Indio
Murrieta
Site Vicinity
Date: 8/14/2024
AQUEDUCT RD
FAVORITO AVE
GENERAL PETROLEUM RD
DAWN RD
TEDMAN BLVD
AVE OF THE STARS
BRIGHTSTAR AVE
LODESTAR AVE
FISHER AVE
STETSON AVE
MOJAVE AVE
ASTORIA AVE
SUE AVE
WILLOW AVE
JAY ST
PATTERSON RD
LOS ANGELES AQUEDUCT
Cottonwood Creek
Pacific Crest National Scenic Trail
170TH ST W
168TH ST W
160TH ST W
150TH ST W
145TH ST W
203RD ST
200TH ST W
2ND AVE
1ST AVE
HAMILTON
Euismod JD
Rosamond, CA
Figure 1 - Regional Overview and Site Vicinity
JE
JENNINGS ENVIRONMENTAL
N
0 0.33 0.65 1.3 1.95 2.6
Miles
Scale: 1:51,848
Service Layer Credits: Light Gray Base: California State Parks, Esri, TomTom, Garmin, FAO, NOAA, USGS, Bureau of Land Management, EPA, NPS, USFWS
USGSTopo: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic

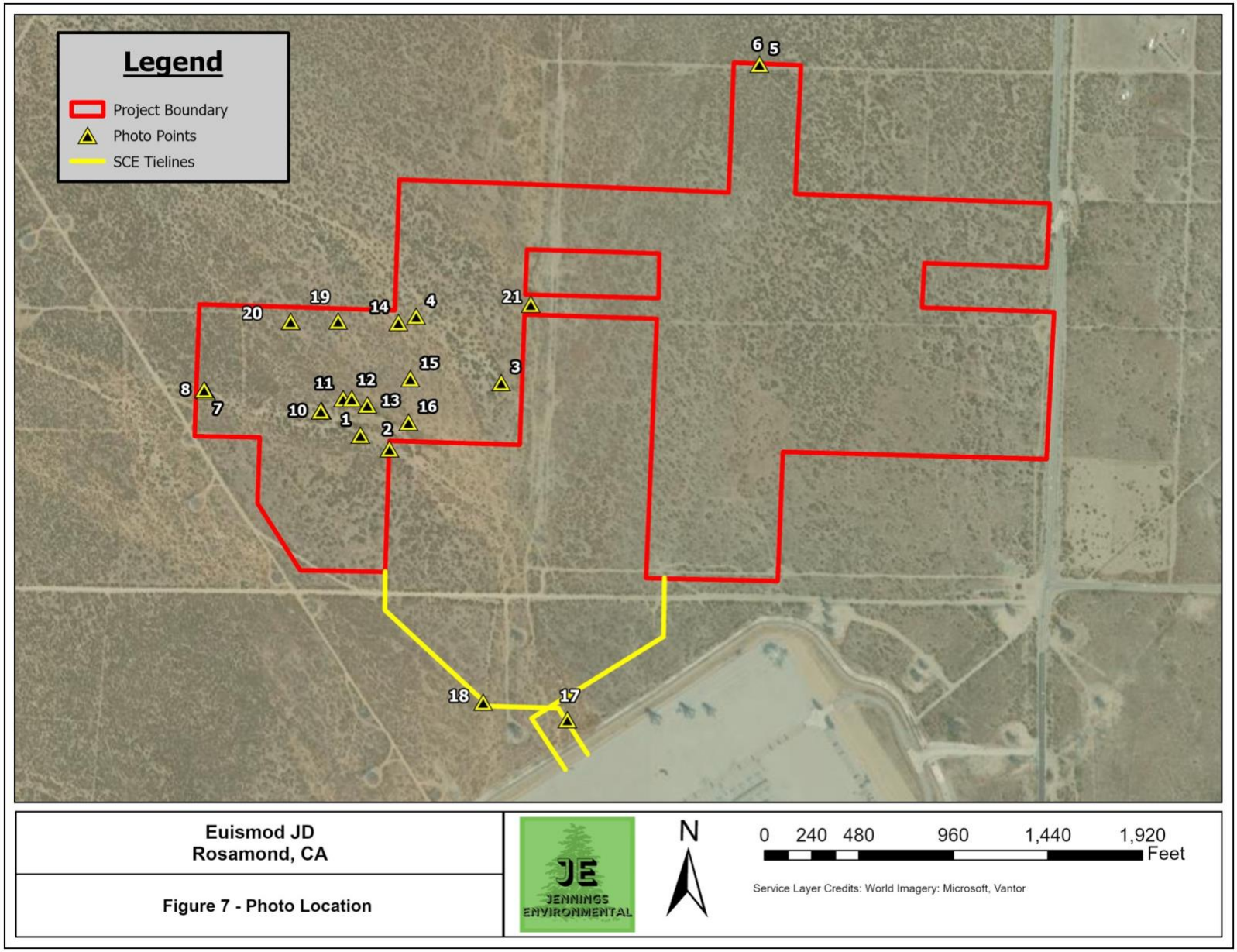

Legend
Project Boundary
SCE Tielines
Rosamond Blvd
170th St W
Date: 4/13/2026
Euismod JD
Rosamond, CA
Figure 2 - Site Location
JE
JENNINGS ENVIRONMENTAL
N
0 312.5 625 1,250 1,875 2,500
Feet
Scale: 1:8,921
Service Layer Credits: World Imagery: Vantor


Legend
Project Boundary
Soils
Cajon loamy sand, 2 to 9 percent slopes (CaC)
Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)
Rosamond fine sandy loam (Ro)
SCE Tielines
Fisher Ave
172nd St W
170th St W
Sahara Ave
Darcy St
Stetso
Date: 2/25/2026
Euismod JD
Rosamond, CA
Figure 3 - Soils Overlay
JE
JENNINGS ENVIRONMENTAL
N
0 255 510 1,020 1,530 2,040
Feet
Scale: 1:7,698
Service Layer Credits: Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Imagery: Microsoft, Vantor

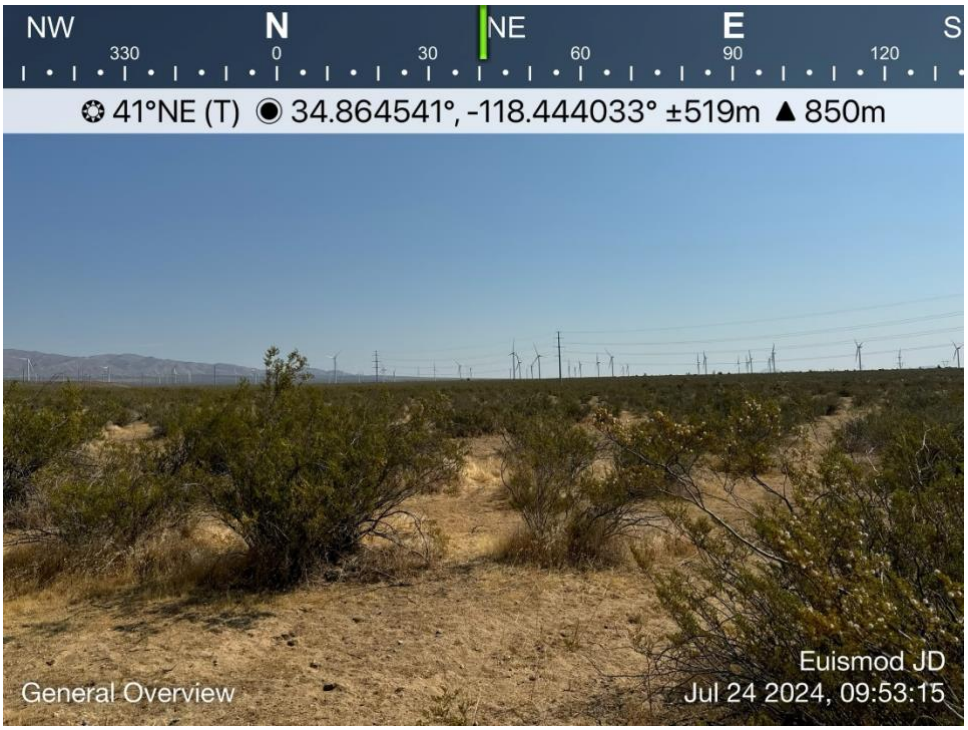
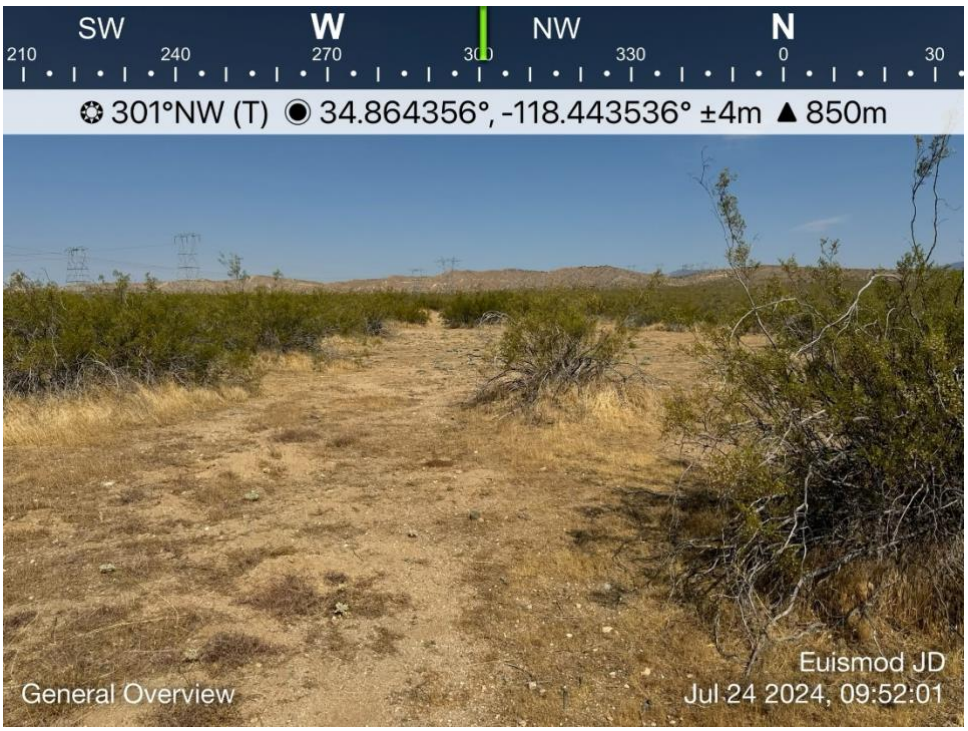

Caparell Creek-Frontal Kern Lake Bed
Tejon Creek
Peerless Valley
El Paso Creek
Legend
Site Location
Watershed Boundary
Tropico Hill-Oak Creek
Liveoak Canyon-Pastoria Creek
Cottonwood Creek-Tylerhorse Canyon
Grapevine Creek
Rogers Lake
Sacatara Creek-Kings Canyon
Rosamond Lake
Rock Creek-Buckhorn Lake
Upper Piru Creek
Mescal Creek-Rocky Buttes
Amargosa Creek
Town of Pearblossom
Castaic Creek
Big Rock Creek-Big Rock Wash
Lower Piru Creek
Upper Santa Clara River
Little Rock Wash
Lake Palmdale-Piute Ponds
Bouquet Canyon
Headwaters Santa Clara River
Date: 4/10/2026
Euismod JD
Rosamond, CA
Figure 4 - Hydrology
JE
JENNINGS ENVIRONMENTAL
N
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Miles
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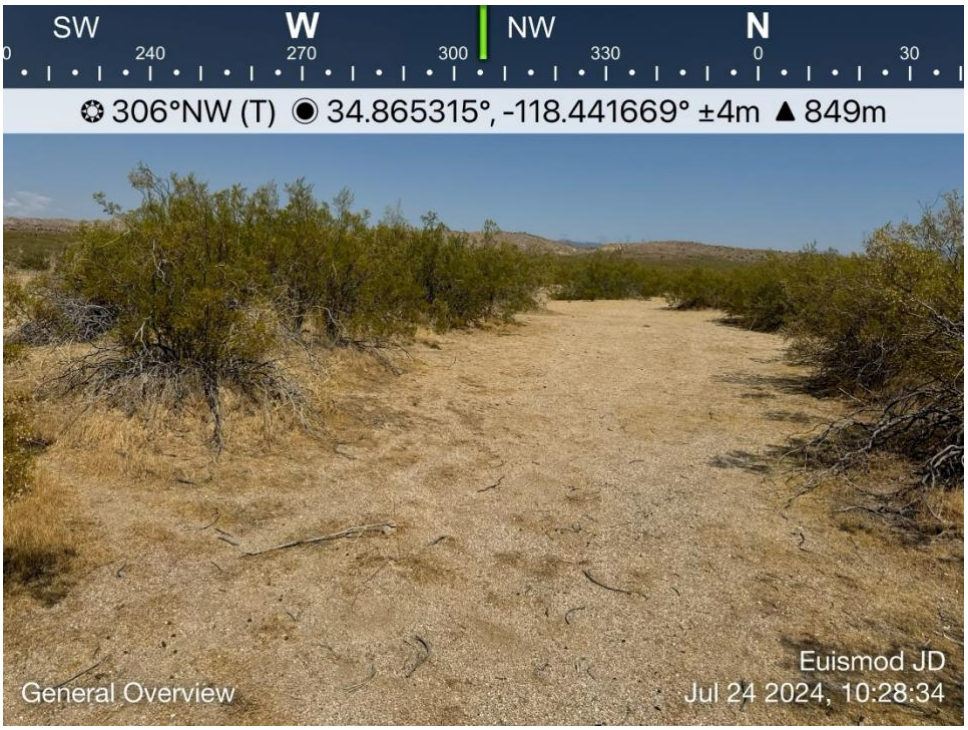
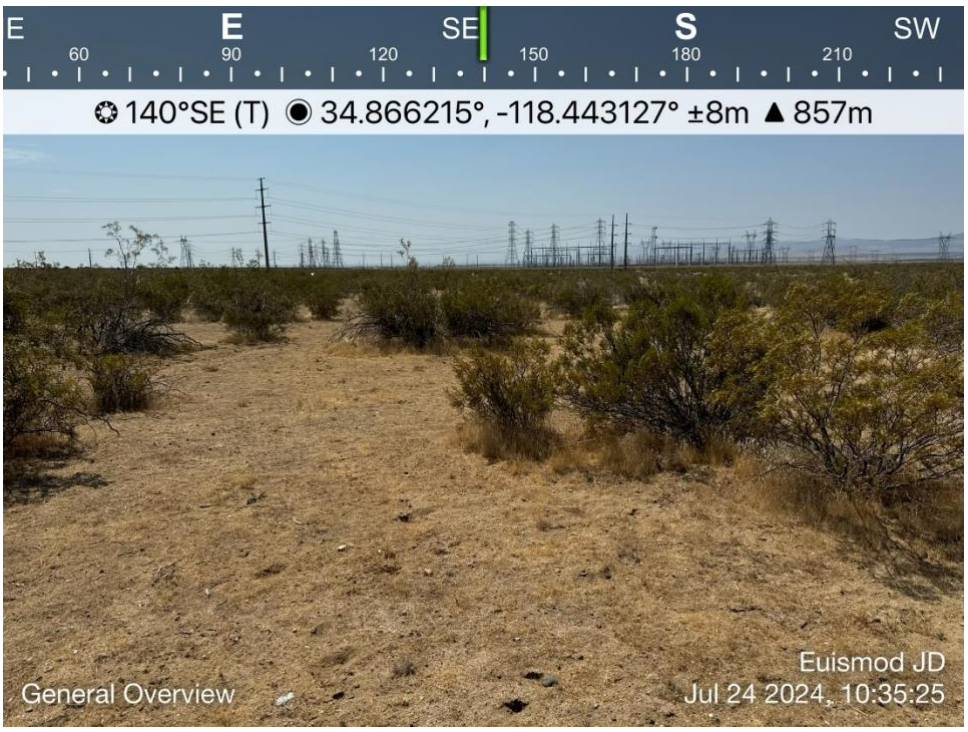

Project Overview
Legend
Waters of the State (WOS)
Project Boundary
SCE Tielines
Tieline Buffer
Date: 4/13/2026
Euismod JD
Rosamond, CA
Figure 5 - Waters of the State
JE
JENNINGS ENVIRONMENTAL
N
0 155 310 620 930 1,240
Feet
Scale: 1:4,404
Service Layer Credits: World Imagery: Vantor


Project Overview
Legend
Project Boundary
SCE Tielines
CDFW Jurisdiction
Tieline Buffer
Date: 2/25/2026
Euismod JD
Rosamond, CA
Figure 6 - CDFW Jurisdiction
JE
JENNINGS ENVIRONMENTAL
N
0 170 340 680 1,020 1,360
Feet
Scale: 1:5,370
Service Layer Credits: Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Imagery: Microsoft, Vantor
World Imagery: Vantor


Legend
Project Boundary
Photo Points
SCE Tielines
6
5
19
20
14
4
21
15
3
8
7
11
12
13
16
10
1
2
18
17
Euismod JD
Rosamond, CA
Figure 7 - Photo Location
JE
JENNINGS ENVIRONMENTAL
N
0 240 480 960 1,440 1,920
Feet
Service Layer Credits: World Imagery: Microsoft, Vantor

Appendix B - Photos

	Photo 1 – General Overview, facing northeast.
	Photo 2 – General Overview, facing northwest.

	Photo 3 – General Overview, facing northwest.
	Photo 4 – General Overview, facing southeast.

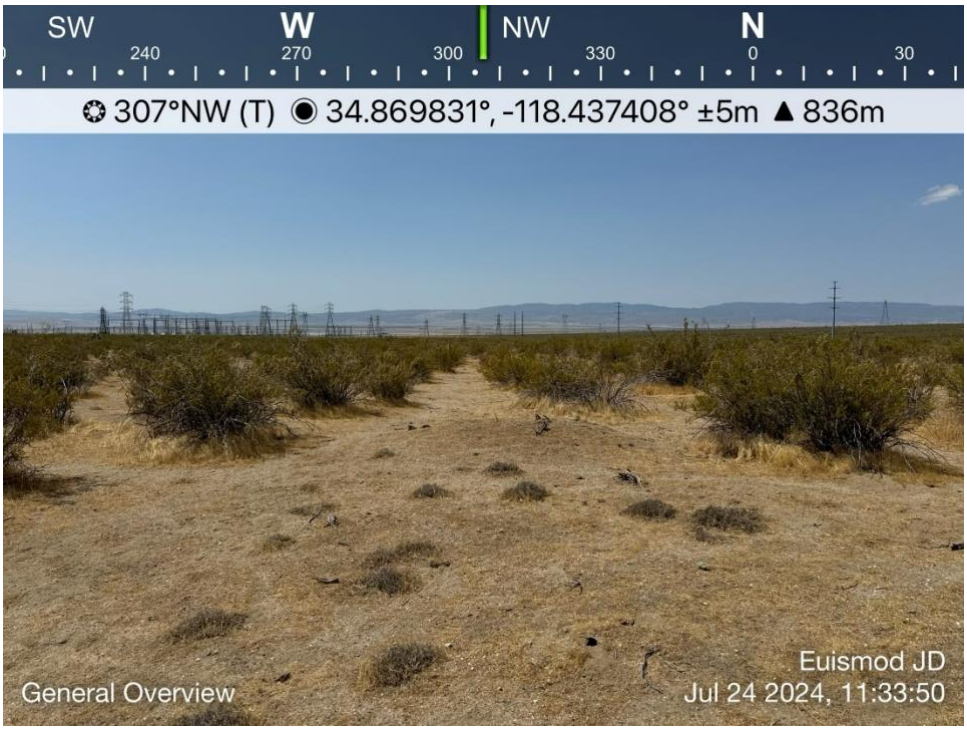
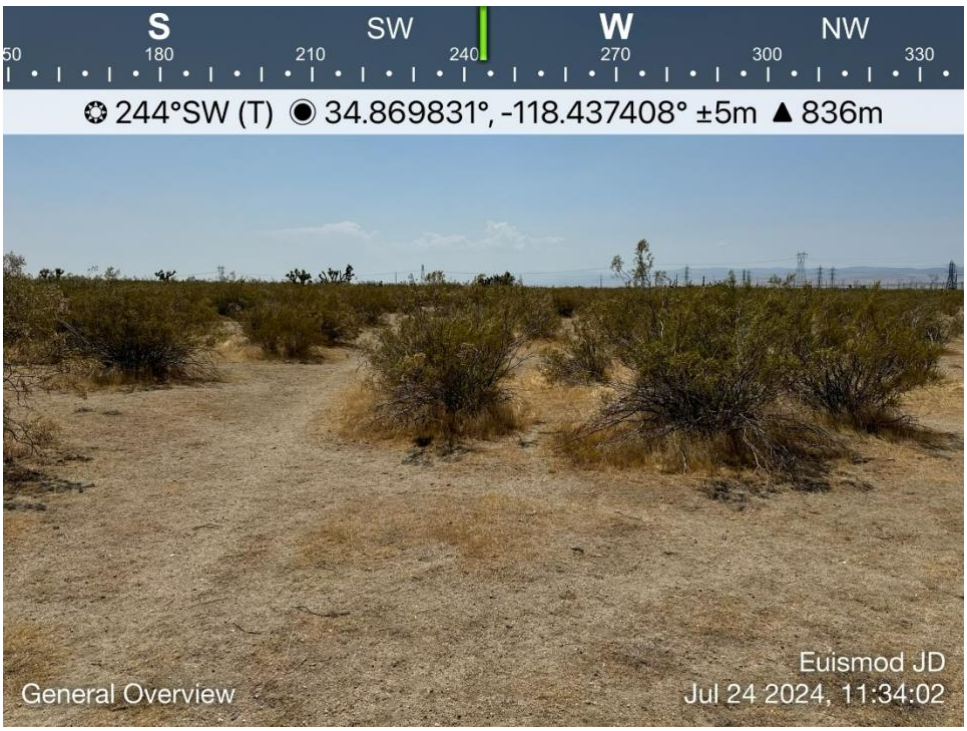
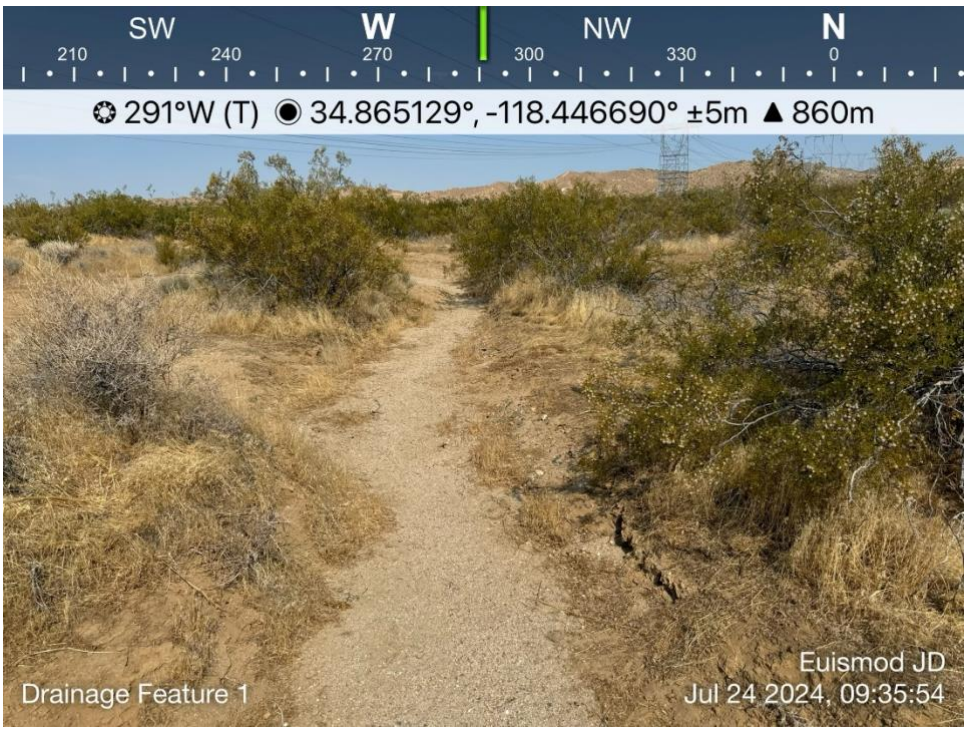
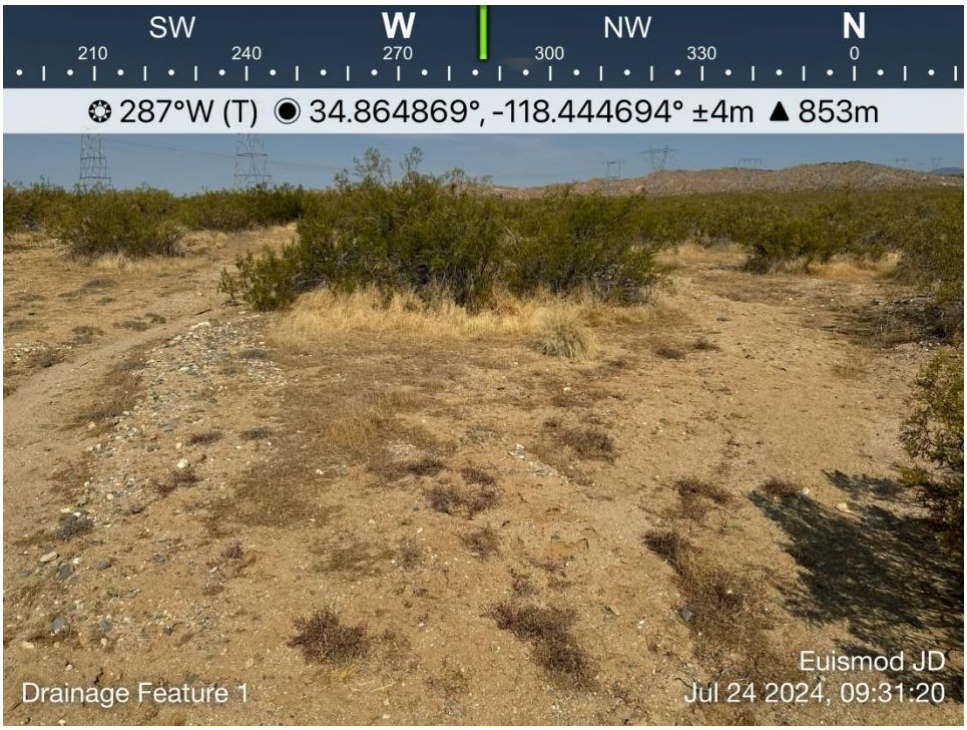
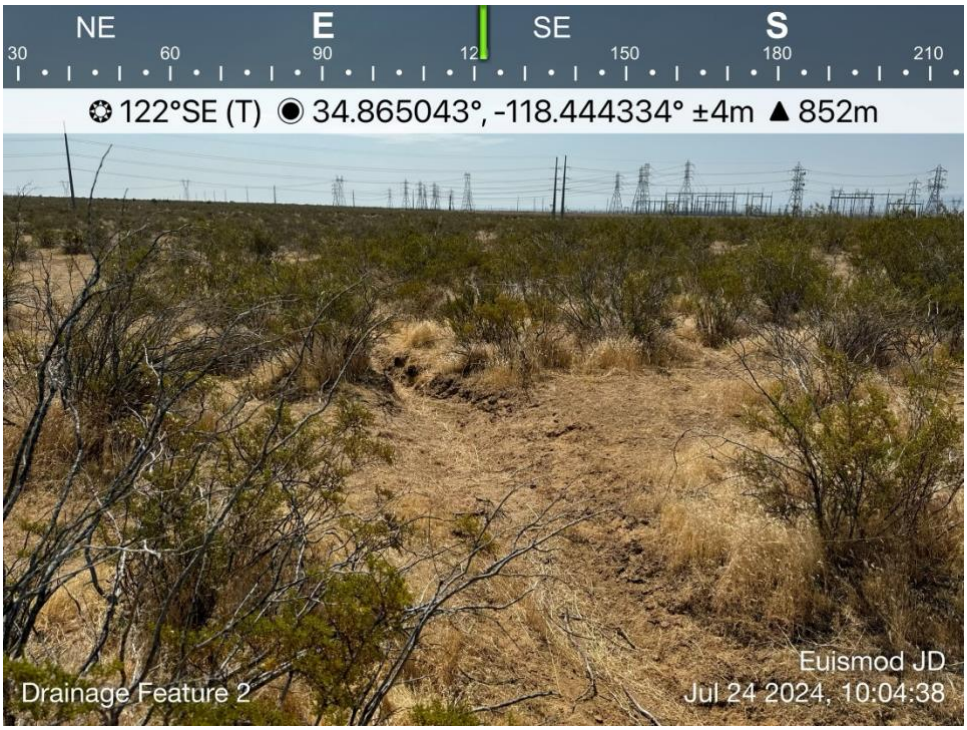
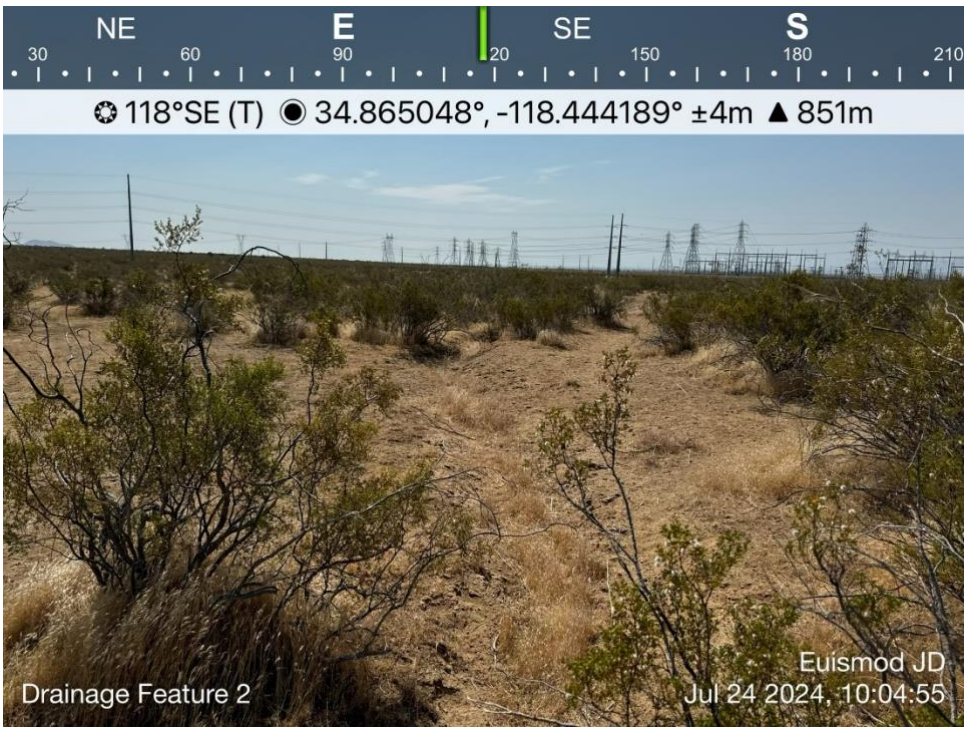
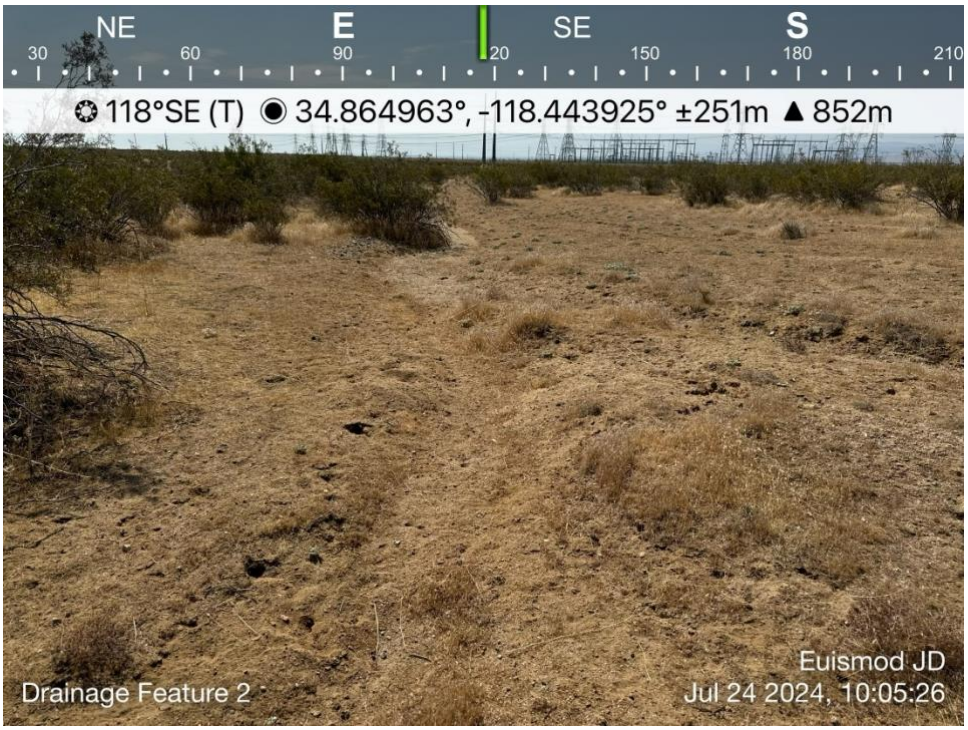
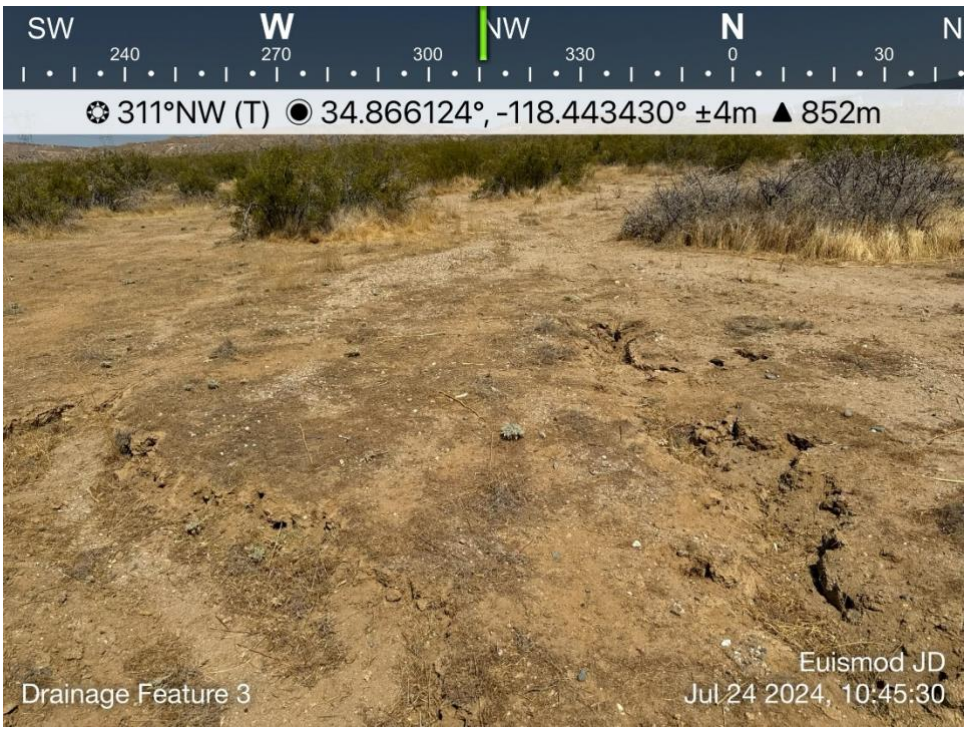
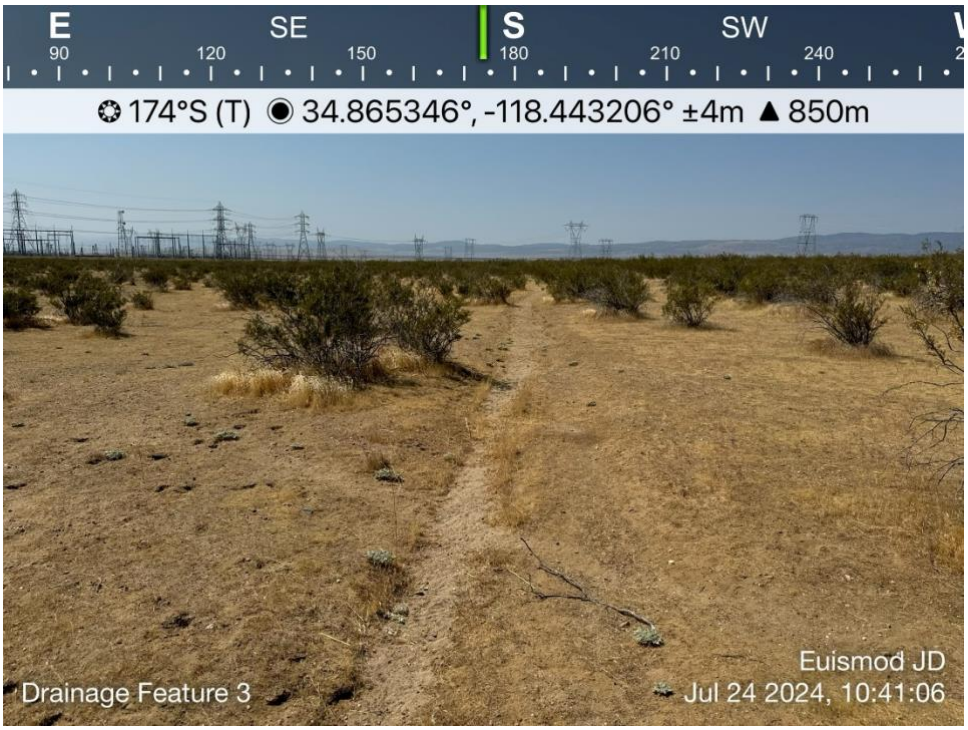
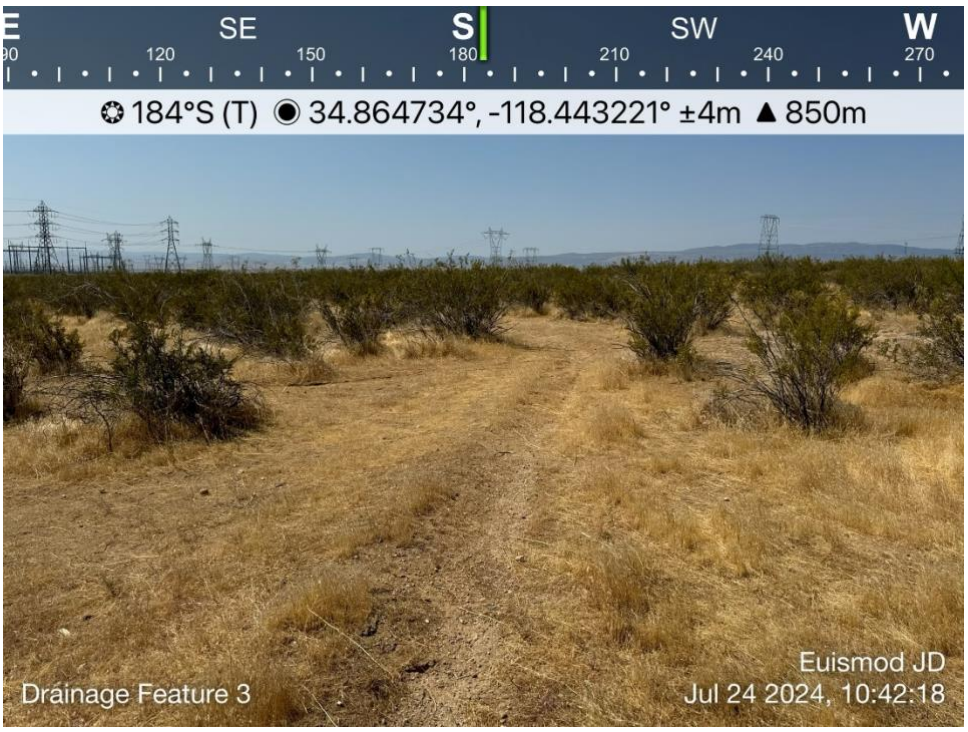
	Photo 5 – General Overview, facing northwest.
	Photo 6 – General Overview, facing southwest.

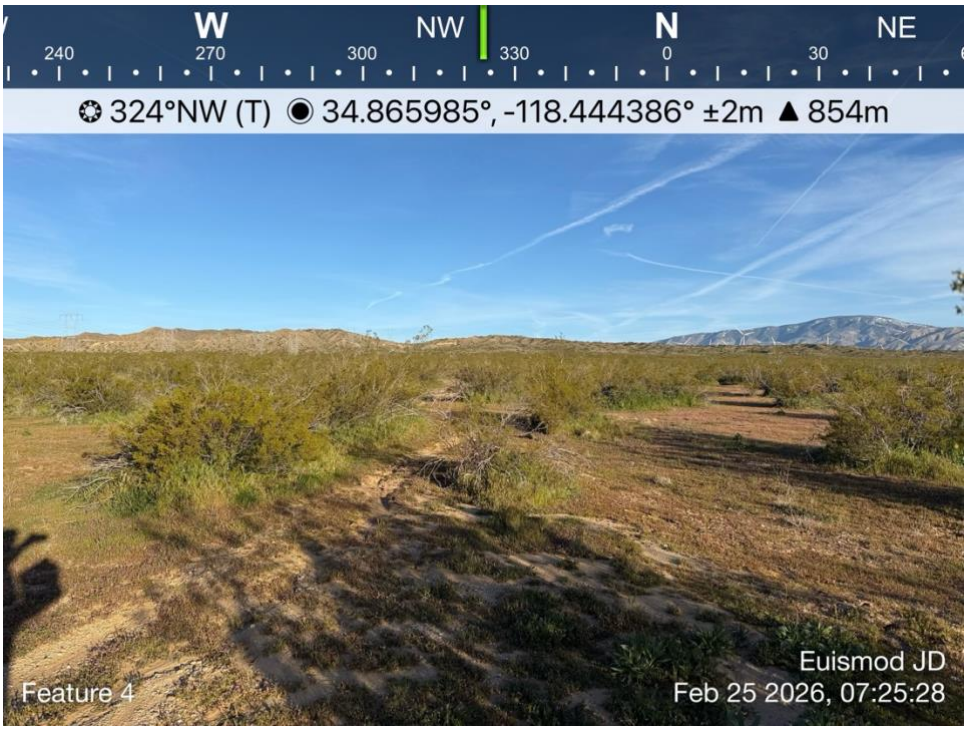
	Photo 7 – Drainage Feature 1
	Photo 8 – Drainage Feature 1

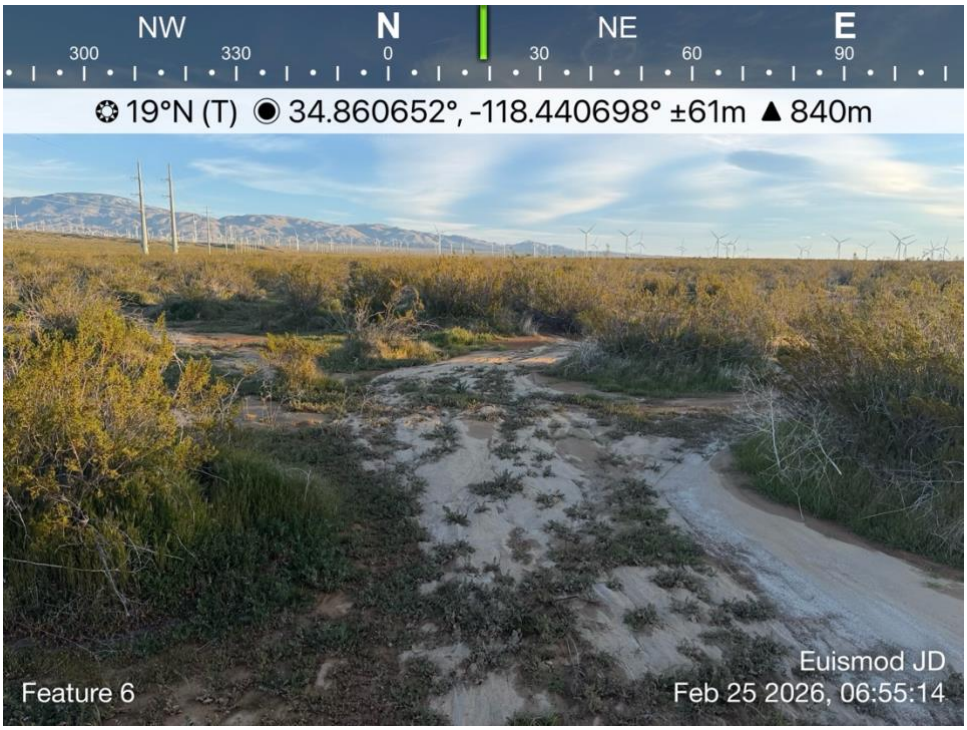
	Photo 9 – Drainage Feature 1
	Photo 10 – Drainage Feature 1

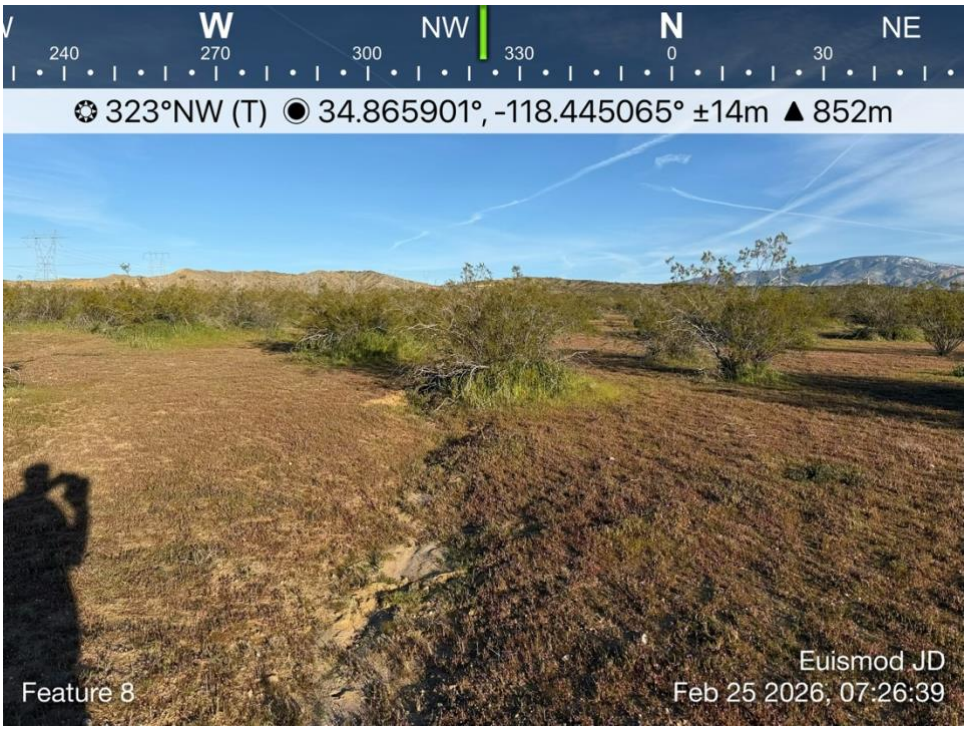
	Photo 11 – Drainage Feature 2
	Photo 12 – Drainage Feature 2

	Photo 13 – Drainage Feature 2
	Photo 14 – Drainage Feature 3

	Photo 15 – Drainage Feature 3
	Photo 16 – Drainage Feature 3

	Photo 17 – Drainage Feature 4
	Photo 18 – Drainage Feature 5

	Photo 19 – Drainage Feature 6
	Photo 20 – Drainage Feature 7

	Photo 21 – Drainage Feature 8

Appendix C – Regulatory Framework

1.1 FEDERAL JURISDICTION

1.1.1 United States Army Corps of Engineers

Activities within inland streams, wetlands, and riparian areas in California are regulated by agencies at the federal, state, and regional levels. At the federal level, the U.S. Army Corps of Engineers (USACE) Regulatory Program regulates activities within wetlands and waters of the US pursuant to Section 404 of the Federal Clean Water Act (CWA).

At the state level, the California Department of Fish and Wildlife (CDFW) regulates activities within the bed, bank, and associated habitat of a stream under the Fish and Game Code §§ 1600–1616. The California State Water Resources Board (SWRB) delegates authority at the regional level to Regional Water Quality Control Boards (RWQCB) that are responsible for regulating discharge into waters of the US under Section 401 of the federal CWA and waters of the State under the California Porter-Cologne Water Quality Act.

The CWA was implemented to maintain and restore the chemical, physical, and biological integrity of the Waters of the United States (33 Code of Federal Regulations [CFR] Part 328 Section 328.3). "Waters of the US" are defined as follows:

> **§ 328.3 Definitions.**
> For the purpose of this regulation these terms are defined as follows:
> (a) *Waters of the United States* means:
> (1) Waters which are:
> (i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
> (ii) The territorial seas; or
> (iii) Interstate waters, including interstate wetlands;
> (2) Impoundments of waters otherwise defined as waters of the United States under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section;
> (3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section:
> (i) That are relatively permanent, standing or continuously flowing bodies of water; or
> (ii) That either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section;
> (4) Wetlands adjacent to the following waters:
> (i) Waters identified in paragraph (a)(1) of this section; or
> (ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3)(i) of this section and with a continuous surface connection to those waters; or

(iii) Waters identified in paragraph (a)(2) or (3) of this section when the wetlands either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section;

(5) Intrastate lakes and ponds, streams, or wetlands not identified in paragraphs (a)(1) through (4) of this section:

(i) That are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3)(i) of this section; or

(ii) That either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section.

(b) The following are not ''waters of the United States'' even where they otherwise meet the terms of paragraphs (a)(2) through (5) of this section:

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act;

(2) Prior converted cropland designated by the Secretary of Agriculture The exclusion would cease upon a change of use, which means that the area is no longer available for the production of agricultural commodities. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA;

(3) Ditches (including roadside ditches) excavated wholly in and draining only dry land and that do not carry a relatively permanent flow of water;

(4) Artificially irrigated areas that would revert to dry land if the irrigation ceased;

(5) Artificial lakes or ponds created by excavating or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;

(6) Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating or diking dry land to retain water for primarily aesthetic reasons;

(7) Waterfilled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States; and

(8) Swales and erosional features (*e.g.,* gullies, small washes) characterized by low volume, infrequent, or short duration flow.

(c) In this section, the following definitions apply:

(1) *Wetlands* means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically
adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
(2) *Adjacent* means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes, and the like are ''adjacent wetlands.''
(3) *High tide line* means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such at those accompanying a hurricane or other intense storm.
(4) *Ordinary high water mark* means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
(5) *Tidal waters* means those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.
(6) *Significantly affect* means a material influence on the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section. To determine whether waters, either alone or in combination with similarly situated waters in the region, have a material influence on the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section, the
functions identified in paragraph (c)(6)(i) of this section will be assessed and the factors identified in paragraph (c)(6)(ii) of this section will be considered:

(i) Functions to be assessed:

(A) Contribution of flow;
(B) Trapping, transformation, filtering, and transport of materials (including nutrients, sediment, and other pollutants);
(C) Retention and attenuation of floodwaters and runoff;
(D) Modulation of temperature in waters identified in paragraph (a)(1) of this section; or
(E) Provision of habitat and food resources for aquatic species located in waters identified in paragraph (a)(1) of this section;

(ii) Factors to be considered:
(A) The distance from a water identified in paragraph (a)(1) of this section;
(B) Hydrologic factors, such as the frequency, duration, magnitude, timing, and rate of hydrologic connections, including shallow subsurface flow;
(C) The size, density, or number of waters that have been determined to be similarly situated;
(D) Landscape position and geomorphology; an
(E) Climatological variables such as temperature, rainfall, and snowpack.

1.2 STATE JURISDICTION

The State of California (State) regulates discharge of material into waters of the State pursuant to Section 401 of the CWA as well as the California Porter-Cologne Water Quality Control Act (Porter-Cologne; California Water Code, Division 7, §13000 et seq.). Waters of the State are defined by Porter-Cologne as "any surface water or groundwater, including saline waters, within the boundaries of the state" (Water Code Section 13050(e)). Waters of the State broadly includes all waters within the State's boundaries (public or private), including waters in both natural and artificial channels.

1.2.1 Regional Water Quality Control Board

Under Porter-Cologne, the State Water Resources Control Board (SWRCB) and the local Regional Water Quality Control Boards (RWQCB) regulate the discharge of waste into waters of the State. Discharges of waste include "fill, any material resulting from human activity, or any other 'discharge' that may directly or indirectly impact 'waters of the state.'" Porter-Cologne reserves the right for the State to regulate activities that could affect the quantity and/or quality of surface and/or groundwaters, including isolated wetlands, within the State. Wetlands were defined as waters of the State if they demonstrated both wetland hydrology and hydric soils. Waters of the State determined to be jurisdictional for these purposes require, if impacted, waste discharge requirements (WDRs).

When an activity results in fill or discharge directly below the OHWM of jurisdictional waters of the United States (federal jurisdiction), including wetlands, a CWA Section 401 Water Quality Certification is required. If a proposed project is not subject to CWA Section 401 certification but involves activities that may result in a discharge to waters of the State, the project may still be regulated under Porter-Cologne and may be subject to waste discharge requirements. In cases where waters apply to both CWA and Porter-Cologne, RWQCB may consolidate permitting requirements to one permit.

1.2.2 California Department of Fish and Wildlife

Pursuant to Division 2, Chapter 6, Sections 1600-1602 of the California Fish and Game Code, the California Department of Fish and Wildlife (CDFW) regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake, which supports fish or wildlife.

CDFW defines a "stream" (including creeks and rivers) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation" (California Code of Regulations, Title 14, Section 1.72). The jurisdiction of CDFW may include areas in or near intermittent streams, ephemeral streams, rivers, creeks, dry washes, sloughs, blue-line streams that are indicated on USGS maps, watercourses that may contain subsurface flows, or within the flood plain of a water body. CDFW's definition of "lake" includes "natural lakes or man-made reservoirs." CDFW limits of jurisdiction typically include the maximum extents of the uppermost bank-to-bank distance and/or the outermost extent of riparian vegetation dripline, whichever measurement is greater.

In a CDFW guidance of stream processes and forms in dryland watersheds (Vyverberg 2010), streams are identified as having one or more channels that may all be active or receive water only during some high flow event. Subordinate features, such as low flow channels, active channels, banks associated with secondary channels, floodplains, and stream-associated vegetation, may occur within the bounds of a single, larger channel. The water course is defined by the topography or elevations of land that confine a stream to a definite course when its waters rise to their highest level. A watercourse is defined as a stream with boundaries defined by the maximal extent or expression on the landscape even though flow may otherwise be intermittent or ephemeral.

Artificial waterways such as ditches (including roadside ditches), canals, aqueducts, irrigation ditches, and other artificially created water conveyance systems also may be under the jurisdiction of CDFW. CDFW may claim jurisdiction over these features based on the presence of habitat characteristics suitable to support aquatic life, riparian vegetation, and/or stream-dependent terrestrial wildlife. As with natural waterways, the limit of CDFW jurisdiction of

artificial waterways includes the uppermost bank-to-bank distance and/or the outermost extent of riparian vegetation dripline, whichever measurement is greater.

CDFW does not have jurisdiction over wetlands but has jurisdiction to protect against a net loss of wetlands. CDFW supports the wetland criteria recognized by USFWS; one or more indicators of wetland conditions must exist for wetlands conditions to be considered present. The following is the USFWS accepted definition of a wetland:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the lands supports hydrophytes, (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated withwater or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

In A Clarification of the U.S. Fish and Wildlife Service's Wetland Definition (Tiner 1989), the USFWS definition was further clarified "that in order for any area to be classified as wetland by the Service, the area must be periodically saturated or covered by shallow water, whether wetland vegetation and/or hydric soils are present or not; this hydrologic requirement is addressed in the first sentence of the definition." When considering whether an action would result in a net loss of wetlands, CDFW will extend jurisdiction to USFWS-defined wetland conditions where such conditions exist within the riparian vegetation that is associated with a stream or lake and does not depend on whether those features meet the three-parameter USACE methodology of wetland determination. If impacts to wetlands under the jurisdiction of CDFW are unavoidable, a mitigation plan will be implemented in coordination with CDFW to support the CDFW policy of "no net loss" of wetland habitat.

Appendix D – OHWM Datasheets

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Euismod JD | **Date: 07/24/24** | **Time:0800**
Project Number: Sample Point 1 | **Town: Rosamond** | **State:CA**
Stream: Unnamed Drainage | **Photo begin file#: Photo 9** | **Photo end file#: Photo 9**
Investigator(s): Eugene Jennings

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Vacant land in unincorporated Kern County

Projection: NAD **Datum: 84**
Coordinates: 34.864834 / -118.444776

Potential anthropogenic influences on the channel system:
Annual rains may alter course of ephemeral drainage.

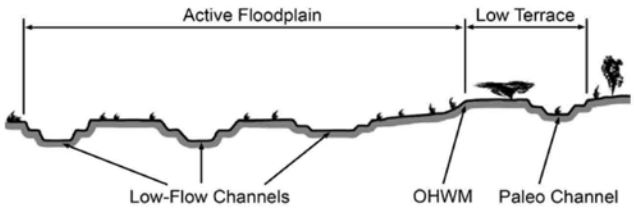
Brief site description:
Vacant desert land with ephemeral drainages.

Checklist of resources (if available):

- ■ Aerial photography
  Dates:
- ■ Topographic maps
- ☐ Geologic maps
- ■ Vegetation maps
- ■ Soils maps
- ■ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ■ Mapping on aerial photograph
   - ■ Digitized on computer
   - ■ GPS
   - ☐ Other:

Project ID: **Cross section ID:** **Date:** **Time:**

Cross section drawing:



OHWM

GPS point: 34.864834 / -118.444776

Indicators:

- ☒ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Sandy ephemeral dry desert wash.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 34.864834 / -118.444776

Characteristics of the floodplain unit:

Average sediment texture: Sand

Total veg cover: 5 % Tree: ____% Shrub: ____% Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Euismod JD | **Date: 07/24/24** | **Time:0815**
Project Number: Sample Point 2 | **Town: Rosamond** | **State:CA**
Stream: Unnamed Drainage | **Photo begin file#: Photo 11** | **Photo end file#: Photo 11**
Investigator(s): Eugene Jennings

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Vacant land in unincorporated Kern County

Projection: NAD **Datum: 84**
Coordinates: 34.865033 / -118.444453

Potential anthropogenic influences on the channel system:
Annual rains may alter course of ephemeral drainage.

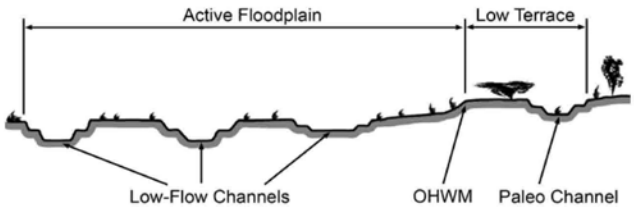
Brief site description:
Vacant desert land with ephemeral drainages.

Checklist of resources (if available):

- ■ Aerial photography
  Dates:
- ■ Topographic maps
- ☐ Geologic maps
- ■ Vegetation maps
- ■ Soils maps
- ■ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ■ Mapping on aerial photograph
   - ■ Digitized on computer
   - ■ GPS
   - ☐ Other:

Project ID: **Cross section ID:** **Date:** **Time:**

Cross section drawing:



OHWM

GPS point: 34.865033 / -118.444453

Indicators:

- ☒ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Sandy ephemeral dry desert wash.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 34.865033 / -118.444453

Characteristics of the floodplain unit:

Average sediment texture: Sand

Total veg cover: 5 % Tree: ____% Shrub: ____% Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Euismod JD | **Date: 07/24/24** | **Time:0830**
Project Number: Sample Point 3 | **Town: Rosamond** | **State:CA**
Stream: Unnamed Drainage | **Photo begin file#: Photo 15** | **Photo end file#: Photo 15**
Investigator(s): Eugene Jennings

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Vacant land in unincorporated Kern County

Projection: NAD **Datum: 84**
Coordinates: 34.865344 / -118.443266

Potential anthropogenic influences on the channel system:
Annual rains may alter course of ephemeral drainage.

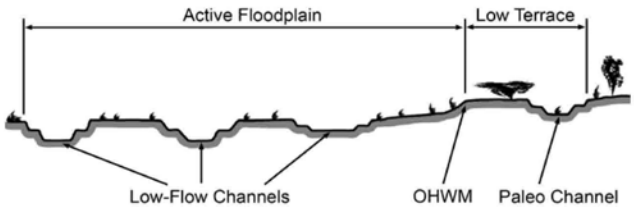
Brief site description:
Vacant desert land with ephemeral drainages.

Checklist of resources (if available):

- ■ Aerial photography
  Dates:
- ■ Topographic maps
- ☐ Geologic maps
- ■ Vegetation maps
- ■ Soils maps
- ■ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ■ Mapping on aerial photograph
   - ■ Digitized on computer
   - ■ GPS
   - ☐ Other:

Project ID: **Cross section ID:** **Date:** **Time:**

Cross section drawing:



OHWM

GPS point: 34.865344 / -118.443266

Indicators:

- ☒ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Sandy ephemeral dry desert wash.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 34.865344 / -118.443266

Characteristics of the floodplain unit:

Average sediment texture: Sand

Total veg cover: 5 % Tree: ____% Shrub: ____% Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

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Appendix C10
Preliminary Summary of the 2026 Swainson's Hawk and Crotch's Bumble Bee Surveys

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TRC
6 Executive Circle
Suite 200
Irvine, CA 92614

Main 949.727.9336

To:	Victoria Edwards, Project Development Associate, CAISO Euismod Project LLC and Euismod Project I LLC
From:	Joseph Stenger, Principal III
Subject:	2026 Biological Surveys Update, Euismod Project
Date:	June 11, 2026
Project No.:	552398

Pursuant to your request, this memorandum provides a summary of ongoing 2026 Swainson's hawk (*Buteo swainsoni*) (SWHA) and Crotch's bumble bee (*Bombus crotchii*) (CBB) surveys for the Euismod Project.

Crotch's Bumble Bee

Surveys for CBB were conducted following CDFW's protocol for bumble bee species (*Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species*, CDFW, June 6, 2023). The surveys included meandering pedestrian transects through all suitable habitat on the Project Site, tie-line corridors, and adjacent 50-foot buffer (Survey Area) with focus on areas with more abundant floral resources where CBB are more likely to be observed foraging. Transects covered the Survey Area three different times, spaced more than two weeks apart during the active colony period and coinciding with floral blooming in the Project area for highest probability of detection. The surveys were completed April 27 - May 1, May 19 - 21, and June 8 -10.

CBB was not observed in any of the April or May surveys. On June 8, 2026, four CBB observations were recorded in the westernmost end of the South BESS Area near 170th Street West. The four observations are believed to be the same two male CBBs observed multiple times. On June 9 and 10, subsequent observations of CBB were made in the same area; all observations were males, at least 3 individuals. The CBB were foraging on large California buckwheat (*Eriogonum fasciculatum*) shrubs, which were growing abundantly along the side of 170th Street West and were in full bloom. Overall, habitat quality on the site for CBB is moderate, with a patch of high quality habitat along 170th Street West where the buckwheat shrubs are. Small mammal burrows provide nesting habitat. Blooming plant diversity on site is low, and many of the flowering species present are very small, however CBB are considered generalist and have been observed foraging on creosote (*Larrea tridentata*) and non-native mustards, which were the two most abundant flowering plant species during the surveys. A report is being prepared and is expected to be available in July 2026.

To minimize any potential impact to CBB, a pre-construction survey will be conducted where suitable habitat is present on or within 50 feet of the Project to confirm that no nests are located within the project area. If nest resources occupied by CBB are detected within the project area, no ground disturbing activities shall occur within 50 feet of the occupied nest resources, or as determined by a qualified biologist through evaluation of topographic features or distribution of floral resources. If take cannot be avoided, the Project Proponent will pursue a take authorization prior to ground disturbance in the area. Take authorization would occur through issuance of an ITP by CDFW, pursuant to Fish and Game Code section 2081(b).

Swainson's hawk

A SWHA nest survey is being conducted for the 2026 nest season following CDFW's recommended survey protocol (*Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy projects in the Antelope Valley of Los Angeles and Kern Counties, California*, California Energy Commission and Department of Fish and Game, June 2, 2010). The survey encompasses the Project Site, tie-line corridors, and 5-mile buffer. Period I, II, and III surveys as defined in the protocol have been completed. The Period IV surveys are scheduled for later in June and July 2026.

The 2026 SWHA nest surveys conducted to date have included the following observations:

- On April 20, 2026, a SWHA pair were observed bringing nesting material to a tree located approximately 2.1 miles southeast of the Project. On April 23, 2026, an adult SWHA was observed perched high on this nest that appeared to be tending the nest since it was perched too high for incubation. The bird continued this activity throughout the observation period. The nest was in a tree surrounded by agricultural fields. The mate was seen in the general area, perching on trees and soaring over adjacent agricultural fields. The pair exhibited strong site fidelity to the nest and the surrounding area.
- On May 4, 2026, the nest described above was found to be no longer in the tree, and no SWHA were observed in the vicinity. A pair of SWHA were observed at a new nest site approximately 2.0 miles southeast of the Project. This is suspected to be the same pair of SWHA previously seen building a nest in first location. The new nest site is a pine tree located adjacent to fallow agricultural fields. The pair was observed perching on nearby poles, on the ground, and soaring over adjacent fields before returning to the nest tree. While on the nest, the bird was not visible in the scope, and incubation was assumed based on flushing and return behavior. The nesting pair was again observed on May 13, 2026, with similar behavior strongly supporting active incubation. A nest exchange between the female and the male was observed on May 13. Observations on May 22 and 25, 2026, continued to be consistent with active incubation.
- On May 22, 2026, an adult SWHA was observed south of the Project outside the five-mile survey buffer near the location of a previously recorded nest. This bird did not exhibit any nesting behavior. On May 25, 2026, this area was observed again with no SWHA identified.
- On May 25, 2026, a new SWHA nest in incubation stage was identified in a tree approximately 7.7 miles east of the Project.

A key finding of the 2026 survey is identification of the nest active in the 2026 season approximately two miles southeast of the Project. The Project is far enough from the nest site to be unlikely to impact nest activity directly. This is the only nest identified in Project studies to date documenting an active nest within five miles of the Project. Active nests are considered to be those with a record of nesting activity within the past five years. CDFW's guidance for SWHA in the Antelope Valley (California

Energy Commission and Department of Fish and Game, June 2, 2010) states that CDFW considers impacts to suitable SWHA habitat within a five mile radius of an active nest to be a significant impact. While the Project lands do not provide high quality habitat or the types of foraging or nesting habitat preferred by SWHA in the region, the identified nesting pair and other SWHA within five miles could potentially use the Project area for foraging, or nesting in Joshua trees. The Project is not expected to have a significant impact on SWHA nesting habitat given the preference in the area for large trees near agricultural fields. Should CDFW recommend SWHA foraging habitat mitigation as a recommended mitigation measure, the Proponents would mitigate foraging impacts to SWHA habitat through compensatory mitigation using a conservation bank such as Butte Valley Conservation Bank or another conservation bank acceptable to CDFW. Credits would be obtained for land providing equal or better habitat value acceptable to CDFW and the County. As an alternative to a conservation bank, the Proponents may propose implementing this mitigation with a turnkey mitigation solution including securing a conservation easement and full coordination with CDFW for approval and funding of habitat management plans. The turnkey option would provide a single-payment solution providing for regulatory compliance through approved habitat management plans.

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Appendix C11
2026 Protocol Swainson's Hawk Survey Report

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Swainson's Hawk Survey Report for the Proposed Euismod Project Willow Springs, Kern County, California Spring 2026

Prepared for:

TRC
6 Executive Circle, Suite 200 Irvine,
California 92614

Prepared by:

Mandy Proudman
Aardvark Biological Services, LLC
1382 Oceanaire Drive
San Luis Obispo, CA 93405
650-224-9375 July
2026

EXECUTIVE SUMMARY

In spring 2026, a Swainson's hawk (*Buteo swainsoni*) literature review and protocol surveys were conducted for the approximate 120-acre Proposed Euismod Project (Project) and a 5-mile buffer, in Willow Springs, Kern County, California. Results indicate that Swainson's hawks are not nesting on the Project but successfully nesting within the 5-mile buffer during the 2026 breeding season.

The literature review identified two historical California Natural Diversity Database (CNDDB) nest occurrence records within the 5-mile buffer. One occurrence was located approximately 2.0 miles southeast of the Project (documented in 2016, 2018, and 2020), and the second approximately 4.3 miles northeast (documented in 2021).

Protocol surveys were completed over ten field days between March 29 and July 11, 2026, following California Energy Commission survey protocols (CEC 2010). A territorial pair was documented building a nest, incubating eggs, and successfully raising two nestlings approximately 2.0 miles southeast of the Project near the historic CNDDB nesting location. This observation is consistent with Swainson's hawks known high site fidelity (CEC 2010). A second active nest containing chicks was documented approximately 7.7 miles east of the Project, outside the 5-mile survey buffer.

No nesting or breeding behavior was observed within the Project footprint despite the presence of potential nesting habitat. The results indicate that suitable breeding habitat continues to occur within the surrounding landscape, particularly adjacent to agricultural fields and fallow fields, while the Project itself appears to provide lower-quality nesting and foraging habitat. This is further supported by the absence of observations and occurrence records within the Project during 2025 surveys (Aardvark 2025a).

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INTRODUCTION

Project Location

The Proposed Euismod Project (Proposed Project) comprises approximately 120 acres located in the west Mojave Desert, in the Willow Springs area, west of Rosamond, Kern County, California (Figure 1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The terrain is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. It lies north of the Southern California Edison (SCE) Whirlwind Substation and is bordered to the east by 170th Street West. To the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Project where it continues as a dirt road. The northernmost end of the Project is bordered by an unnamed dirt road (Figures 1, 2). There are solar installations to the south and east of the Project and a wind energy generation project to the northeast. The Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle) (Township 9N, Range 15W – a portion of the south half of Section 14).

Selected representative photographs for the Project are provided in Appendix A Photos (Photos 1-3).

Project Description

The Project would utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available, such as from renewable sources, and then return it to the grid when needed. The batteries would be contained in outdoor enclosures connected to an onsite substation, that interconnects with the regional electric grid at the Whirlwind 220kV substation to the south of the Project.

Swainson's Hawk Background

Swainson's hawks (*Buteo swainsoni*) are medium sized raptors in the Accipitridae family. Adult birds typically have a characteristic dark head and breast band contrasting with their light-colored belly, and underside of their wings having lighter-colored coverts compared to their dark primaries and secondaries (flight feathers). Birds have broad wings and short tails with color and pattern quite variable, with light, dark and intermediate morphs. California populations of Swainson's hawks breed from late March to mid-August in the state, and then will migrate and overwinter in South America, primarily in Argentina, in late August to October. Historically, Swainson's hawks were found in open habitats such as grasslands and prairies where they nest and primarily forage on mammals and insects. As land use has changed since the early 1900s, large portions of native landscape have been converted to agriculture, renewable energy, and other urban development. This has resulted in



Figure 1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, California.

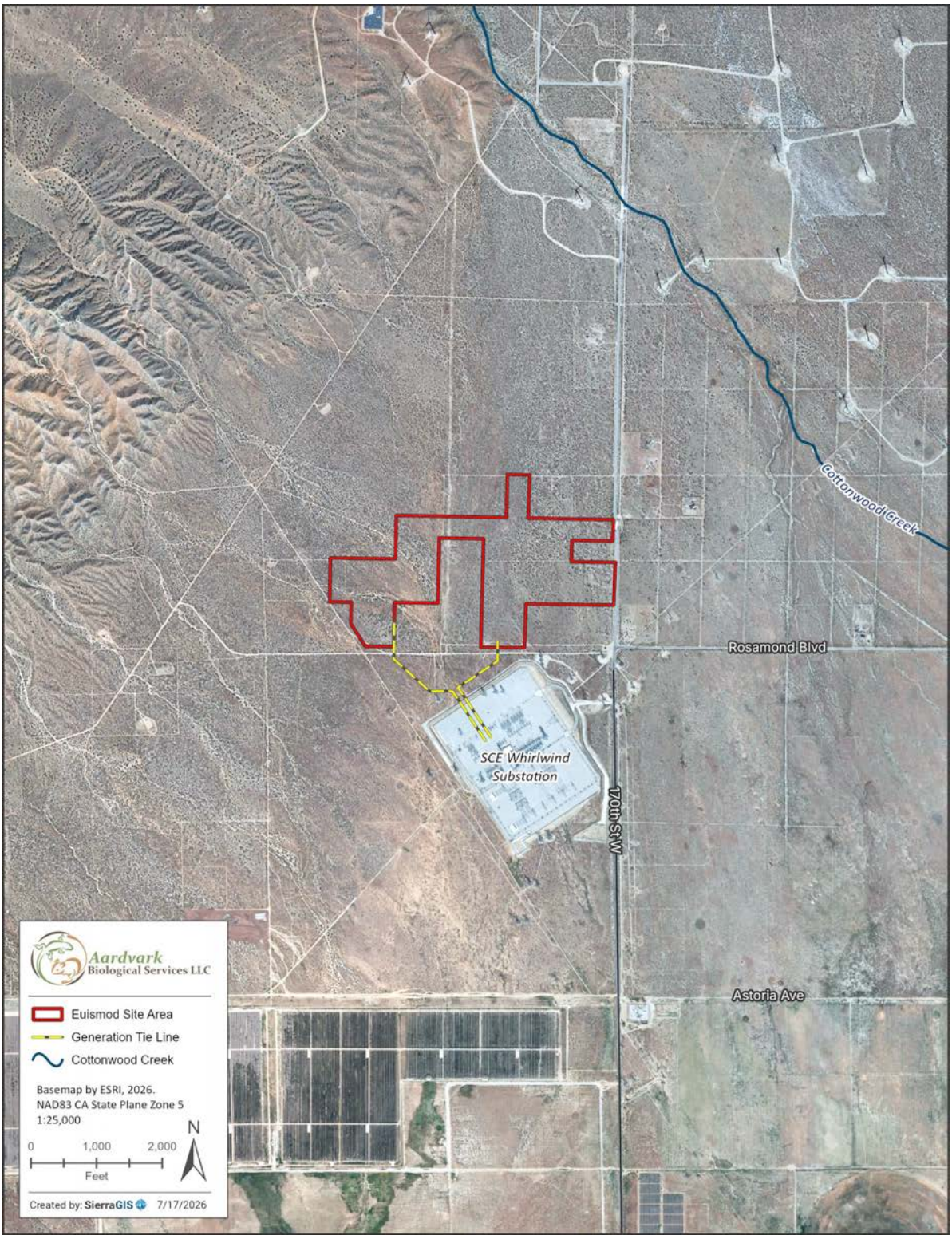


Figure 2. Proposed Euismod Project Location Map, Willow Springs, Kern County, California.

Swainson's Hawk Background (continued) Swainson's hawks often being found adjacent to the open habitats of agricultural fields and pastures, where they utilize solitary trees, hedgerows of trees, and agriculture infrastructure for perching and foraging. They have been shown to have a strong preference for open habitat or habitat with less cover for foraging (Bechard 1982, Bloom 2023). In the Antelope Valley, Swainson's hawk diet has been shown to be dominated mainly by rodents, with some birds, reptiles and amphibians. Botta's pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*), and California ground squirrel (*Otospermophilus beecheyi*) are the most common prey (Bloom 2023).

In the Antelope Valley, Swainson's hawk nesting sites have also changed with native landscape being converted, from historically mainly western Joshua trees (*Yucca brevifolia*) to both western Joshua trees (Joshua trees) and non-native trees such as elm (*Ulmus* spp.), Aleppo pine (*Pinus halepensis*), and tamarisk (*Tamarix* spp.) trees (Bloom 2023). Transmission towers and power poles are rarely used as nesting sites (Bechard 2020). Swainson's hawks are known to have high site fidelity and to re-use nests from previous years (CEC 2010).

Swainson's hawks were listed as threatened under the California Endangered Species Act in 1983 and were designated a Federal Species of Concern in 2002. It is also protected under the Federal Migratory Bird Treaty Act of 1918. Loss of native landscape for foraging and breeding grounds are the main recognized impacts to the population (Bloom 2023).

METHODS

Literature Review

Prior to conducting surveys, a 2025 Swainson's hawk nesting habitat assessment report prepared for the Project (Rincon) and a records report generated using the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) (CDFW) for a 5-mile buffer were reviewed.

Field Surveys

In spring 2026, biologist Mandy Proudman conducted Swainson's hawk protocol surveys using methods from the California Energy Commission and California Department of Fish and Game (now California Department of Fish and Wildlife) document *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California.* (CEC 2010). The protocol surveys were completed over 10 days and 4 Survey Periods (Survey Period I: March 29; Survey Period II: April 7, 20, 23; Survey Period III: May 4, 13, 25; Survey Period IV: June 14, July 10 and July 11) for the approximate 120-acre Project and a 5-mile buffer.

The following table is a summary of the Swainson's hawk protocol survey timing and survey focus as correlated with expected bird behaviors (CEC 2010):

Table 1. Swainson's Hawk Protocol Surveys Timing

Survey Period	Number of Surveys	Timing	Swainson's Hawk (SWHA) Behavior & Main Survey Focus
I	1	January - March 31	Prior to SWHA adult arrival Familiarization with area Locate SWHA potential nesting locations Identify competing species nests
II	3	April 1 - April 30	Most SWHA adults arrived from wintering grounds Identify SWHA territories, courtship Look for SWHA breeding behavior, nest building
III	3	May 1- May 30	SWHA adults on nests - laying, incubating Monitor SWHA nest sites, identify nest locations Look especially for SWHA males returning to nest
IV	3	June 1 - July 15	SWHA young fledging SWHA young active and visible SWHA adults near nest, at nest

The Swainson's hawk protocol surveys were conducted focusing on observations and vocalizations. Driving surveys were primarily used, with walking surveys employed to more thoroughly examine areas or trees when driving was not as effective. Surveyors had high-quality binoculars and spotting scopes. All observations of Swainson's hawks and their behaviors as well as active nests of great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis),* and common raven (*Corvus corax*) were recorded.

RESULTS

Literature Review

The Swainson's hawk nesting habitat assessment prepared for the Project (Aardvark 2025a), had no observations of Swainson's hawks on the Project and 1-mile buffer during 2025. The assessment concluded that the Project is not likely supporting an abundance of nesting Swainson's hawks, but recommended Swainson's hawk pre-construction surveys prior to construction due to existing nesting habitat of western Joshua trees and transmission towers.

The CNDDB report for a 5-mile radius (5-mile buffer) from the Project had Swainson's hawk occurrences approximately 2.0 miles southeast and 4.3 miles northeast of the Project (CNDDB). The record to the southeast has had nests observed in 2016, 2018, and 2020. The 2020 nest was in a Chinese elm (*Ulmus* spp.) adjacent to fallow agricultural fields and two adults and two nestlings were observed. The record to the northeast was observed in 2021 and documented one adult on the nest likely incubating. The nest was in a western Joshua tree in Joshua tree woodland interspersed with dirt access roads and solar facilities in the vicinity.

Field Surveys

During Survey Period I of the Swainson's hawk protocol surveys, Joshua tree woodland, creosote bush (*Larrea tridentata*) scrub with sparse Joshua tree woodland, and non-native single or hedgerows of tree(s) were areas identified as potential nesting habitat in the Project Area and 5-mile buffer (Appendix A, Photos 4-6). The Project Area is composed of creosote bush scrub alliance with sporadic western Joshua trees present (Aardvark 2025c). The creosote bush scrub is mature and commonly 8-10 feet tall. These sporadic western Joshua trees are potential nesting habitat. The networks of lattice transmission towers, H-frame structures, and distribution poles throughout the entire area were also identified as potential nesting habitat, though known to be rarely used (Bechard 2020).

During Swainson's hawk protocol surveys for the Project and the 5-mile buffer, Swainson's hawks were observed during Survey Periods II, III, and IV, and one active nest was checked within the 5-mile buffer throughout the breeding season. On April 20, 2026, a territorial pair was observed carrying nesting material to a tree approximately 2.0 miles southeast of the Project Area, near the historic CNDDB nest location documented in 2016, 2018, and 2020. By April 23, the original nest had no activity, and the pair had relocated to an Aleppo pine where incubation was confirmed based on behavior. Incubation was observed on May 13, and observations on May 22, and May 25, consistent with active incubation at the same location. On June 14, July 10 and 11, two nestlings were observed being fed by the adults, confirming successful reproduction.

A second active Swainson's hawk nest was documented approximately 7.7 miles east of the Project Area, outside the 5-mile survey buffer. This nest was first detected on May 25 within a tamarisk hedgerow approximately 50 feet from a completed solar facility. Located approximately 25 feet high on the eastern side of hedgerow. The nest was monitored throughout the breeding season. Adults were observed delivering prey on June 14, and chicks were confirmed ion July 10 and July 11. This nest is identified as

SWH03 in Figure 3 and Appendix A (Photos 17-18).

No Swainson's hawk nests or breeding behavior were observed in the Project Area. All confirmed nesting activity occurred outside the Project Area, with the closest active nest approximately 2.0 miles southeast in an area adjacent to agricultural fields.

In the area approximately 5.5 miles southwest from the Project, Swainson's hawks were observed on June 23, 2025, and two adult Swainson's hawks and one nest with one chick were observed in a hedgerow of Aleppo pines in 2025 (Aardvark 2025a). During the 2026 surveys, an pair of adult Swainson's hawks was observed in the area on July 10, but no activity was observed on July 11. This suggests this territory could still be active for the 2026 season although no nesting behavior was detected.

Active competing nest species observations over the protocol survey period included four great horned owl, four red-tailed hawk, as well as twenty-one common raven nests. Unknown status or inactive nests were not recorded.

In spring 2025, 10-meter-belt transect desert tortoise, and western burrowing owl surveys were also conducted for the Project (Aardvark 2025b, Aardvark 2025d) and no Swainson's hawk individuals were observed. During these surveys, individuals and sign of known common prey species of Swainson's hawk (Botta's pocket gopher, California vole, and California ground squirrel) were not observed in the Project Area. Black-tailed jackrabbit (*Lepus californicus*), western whiptail (*Cnemidophorus tigris*), and white-tailed antelope ground squirrel (*Ammospermophilus leucurus*) were observed during these surveys; however, these species are known to be the less common prey species of Swainson's hawks (Bloom 2023).

A summary of the Swainson's hawk protocol survey results, including timing, weather conditions, and Swainson's hawk observations, is summarized in Table 2. Locations of the Swainson's hawks, Swainson's hawk nests (SWH01, SWH02, SWH03), and the active nests of competing species are in Figure 3. Photographs taken during protocol surveys of competing species active nests are in Appendix A (Photos 7-11).

Table 2. Swainson's Hawk Protocol Survey Results Summary

	Date	Time	Ambient Temp (°F)	Wind (mph)	Cloud Cover (%)	Precipitation	Visibility	Swainson's Hawk Observations Summary (site=Proposed Euismod Project, SWHA=Swainson's hawk)
Survey Period 1	3/29/26	7:00	65	5-10 WSW	5	None	Unlimited	No SWHA adults, nests, chicks detected during survey inside 5-mile buffer.
	3/29/26	12:00	72	10-15 WSW	10	None	Unlimited	
	3/29/26	3:30	73	15-18 WNW	5	None	Unlimited	
Survey Period 2	4/7/26	7:30	61	13 NW	5	None	unlimited	3 adult SWHA seen inside 5-mile radius. Soaring high and hunting in fields. No nesting behavior detected.
	4/7/26	12:30	79	15 NW	5	None	Unlimited	
	4/7/26	3:30	79	13 NW	15	None	Unlimited	
	4/20/26	6:50	50	6 NE	10	None	Unlimited	Pair of SWHA nest building, acting territorial, perching, and flying (SWH01). No other SWHA detected.
	4/20/26	12:14	78	11 NE	15	None	Unlimited	
	4/20/26	3:10	79	14 NE	10	None	Limited by wind	
	4/23/26	7:30	50	13 E	5	None	Limited by wind	Pair of SWHA incubating on nest in pine, acting territorial, perching, and soaring in fields (SWH02).
	4/23/26	12:45	66	6 W	5	None	Unlimited	
	4/23/26	4:50	73	15-20 WNW	5	None	Unlimited	
Survey Period 3	5/4/26	7:20	52	15 NE	25	None	Limited by wind	SWHA incubating on nest (SWH02). Pair seen at nest.
	5/4/26	12:16	70	16 NE	30	None	Limited by wind	
	5/4/26	3:15	62	13 NE	80	None	Limited by wind	
	5/13/26	6:35	62	15 NE	10	None	Limited by wind	Pair of SWHA seen at active nest inside 5-mile buffer (SWH02). SWHA perched at potential territory outside of 5-mile buffer.
	5/13/26	12:30	84	15 NE	5	None	Limited by wind	
	5/13/26	2:30	85	17 NE	5	None	Limited by wind	
	5/25/26	8:20	63	9 NE	5	None	Unlimited	Pair of SWHA seen at nest inside 5-mile buffer; incubation (SWH02). SWHA nest detected outside buffer approximately 7.7-miles from project site (SWH03).
	5/25/26	12:00	85	15-20 NE	0	None	Limited by wind	
	5/25/26	4:15	75	15-20 WSW	0	None	Limited by wind	
Survey Period 4	6/14/26	7:00	75	5-10 NE	0	None	Unlimited	Pair of SWHA seen feeding at nest inside 5-mile buffer (SWH02). SWHA feeding at nest outside buffer approximately 7.7-miles from project site (SWH03)
	6/14/26	1:03	93	10-13 NE	0	None	Unlimited	
	6/14/26	4:30	90	10-15 NE	0	None	Unlimited	
	7/10/26	6:45	72	10-12 WSW	0	None	Unlimited	SWHA feeding nests at nest location (SWH02). SWHA feeding chicks at nest location outside of buffer (SWH03). Pair of SWHA detected at potential territory at 5.5-mile mark.
	7/10/26	11:15	95	10-15 WSW	0	None	Good	
	7/10/26	17:20	97	10-15 WSW	0	None	Unlimited	
	7/11/26	5:50	73	4-7 WSW	0	None	Unlimited	SWHA feeding 2 nestlings at nest location (SWH02). SWHA feeding nestlings at nest location outside of buffer (SWH03). No SWHA detected at potential territory at 5.5-mile mark.
	7/11/26	10:30	93	10-15 SW	0	None	Good	
	7/11/26	12:00	98	15-20 SW	0	None	Good	

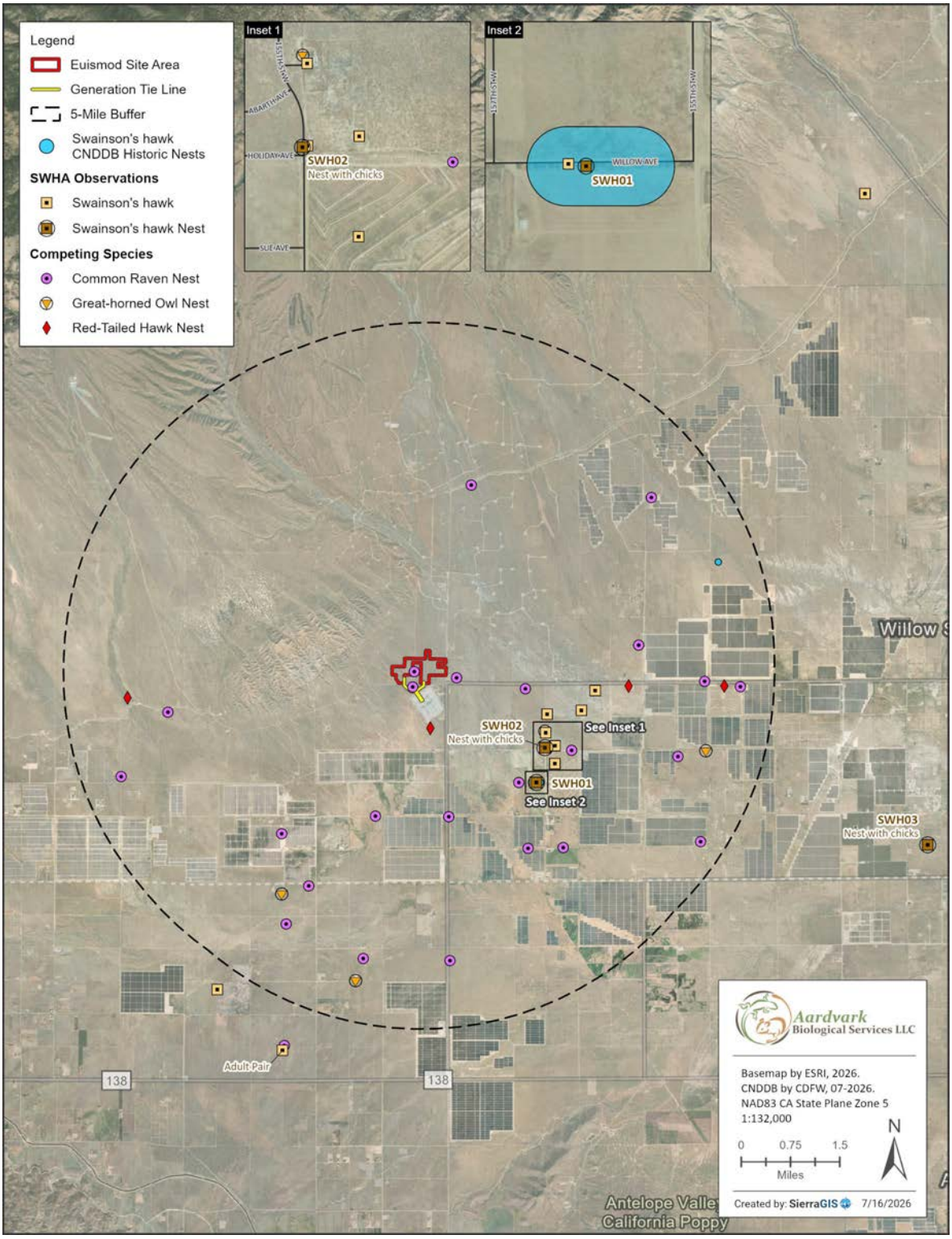


Figure 3. Proposed Euismod Project Locations of Swainson's Hawk and Competing Species Nests, 2026 Swainson's Hawk Protocol Surveys

DISCUSSION

Protocol Swainson's hawk surveys were conducted for the Project and 5-mile buffer in spring 2026. One active Swainson's hawk nest was monitored within the 5-mile buffer, close to the nesting location at the Chinese elms adjacent to agricultural fields and in the same region as the CNDDB nest from 2016, 2018, and 2020. This pair of Swainson's hawks was observed building a nest in Chinese elms on April 20 (SWH01). Photos of the nest are in Appendix A (Photos 12 and 13). The same pair of Swainson's hawks was observed incubating and later feeding two nestlings in an Aleppo pine (SWH02). Photos of the nest are in Appendix A (Photos 14-16).

The 2026 protocol surveys documented the complete progression of the breeding cycle for a Swainson's hawk pair within the 5-mile survey buffer, including nest construction, incubation, and adults feeding two nestlings. These observations confirm successful reproduction and are consistent with the species' strong site fidelity, as the nesting territory was located near the historical CNDDB nest occurrences.

Protocol Swainson's hawk surveys were conducted for the Project in spring 2026; however, no Swainson's hawk nests or breeding behavior were observed within the Project Area despite the presence of potential nesting habitat (i.e., Joshua trees, ornamental trees, and transmission towers). These results indicate that Swainson's hawks are currently not nesting within the Project Area, but are nesting within the 5-mile buffer.

Potential nesting habitat in the Project Area consisted of sporadic western Joshua trees located in creosote bush scrub and transmission towers. This habitat is not considered high-quality foraging grounds for Swainson's hawk (Babcock 1995, Bechard 1982). This is due to the increased cover of the mature, commonly 8-10 feet tall creosote bush shrubs and the lack of common Swainson's hawk prey species observed (Botta's pocket gopher, California vole, and California ground squirrel) (Bloom 2023) during 2025 desert tortoise and western burrowing owl surveys conducted for the Project (Aardvark 2025b, Aardvark 2025d). Potential nesting habitat in the 5-mile buffer included Joshua tree woodland, non-native single or hedgerows of trees, transmission towers, and power poles.

If considering only the Project Area, the potential for Swainson's hawk nesting is lower than within the 5-mile buffer. This is due to the Project Area foraging habitat being of lower quality (as described earlier in the discussion) and reflected in the absence of observations and occurrences in the 2024 and 2025 surveys and past CNDDB records in the Project Area.

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APPENDIX A
PHOTOS

Photo 1



Representative habitat within the Project Area showing mature creosote bush scrub with scattered Joshua trees. April 20, 2026.

Photo 2



Representative habitat within the Project Area showing transmission infrastructure and surrounding habitat. July 11, 2026.

Photo 3



Additional representative habitat within the Project Area showing scattered Joshua trees. July 11, 2026.

Photo 4



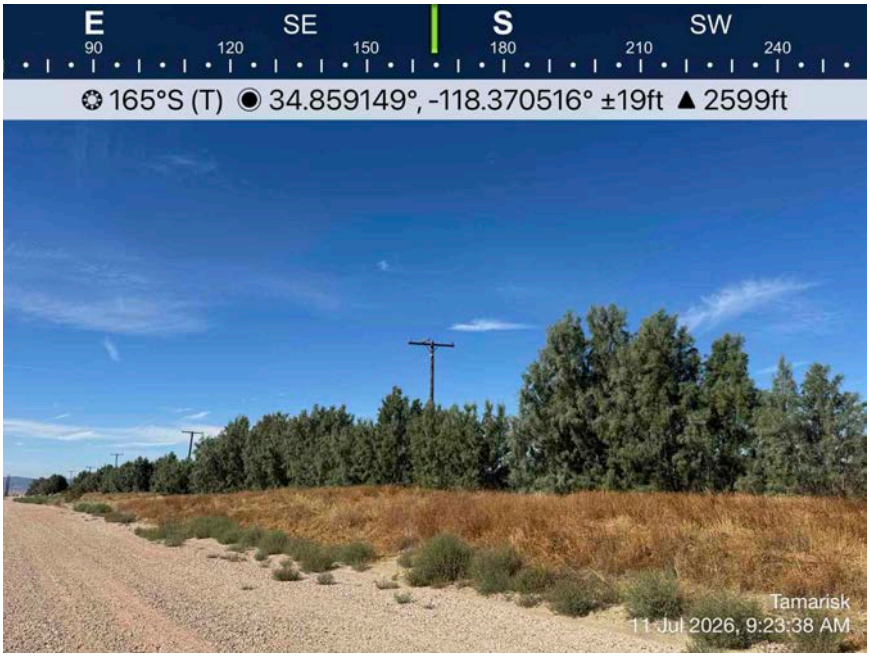
Potential Swainson's hawk nesting habitat consisting of a hedgerow of Chinese elm trees adjacent to agricultural fields. Potential raptor nest highlighted.

Photo 5



Potential Swainson's hawk nesting habitat consisting of an Aleppo pine hedgerow surrounding a residential property.

Photo 6



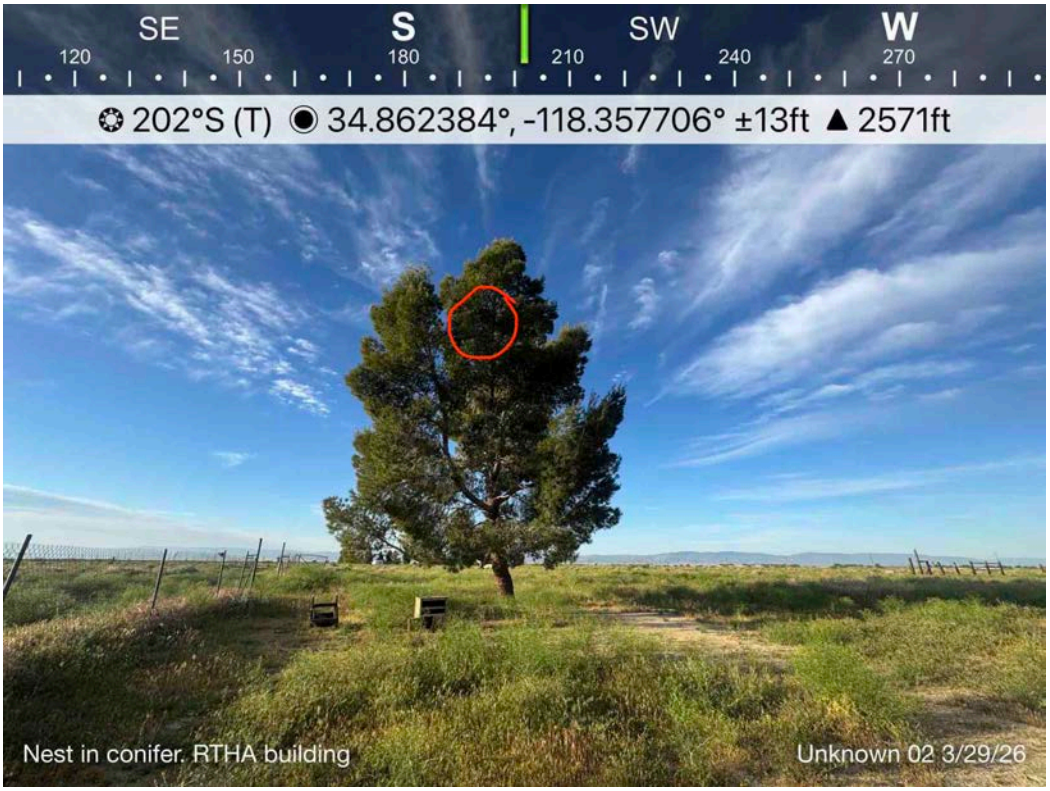
Potential Swainson's hawk nesting habitat consisting of a tamarisk hedgerow adjacent to a dirt access road.

Photo 7



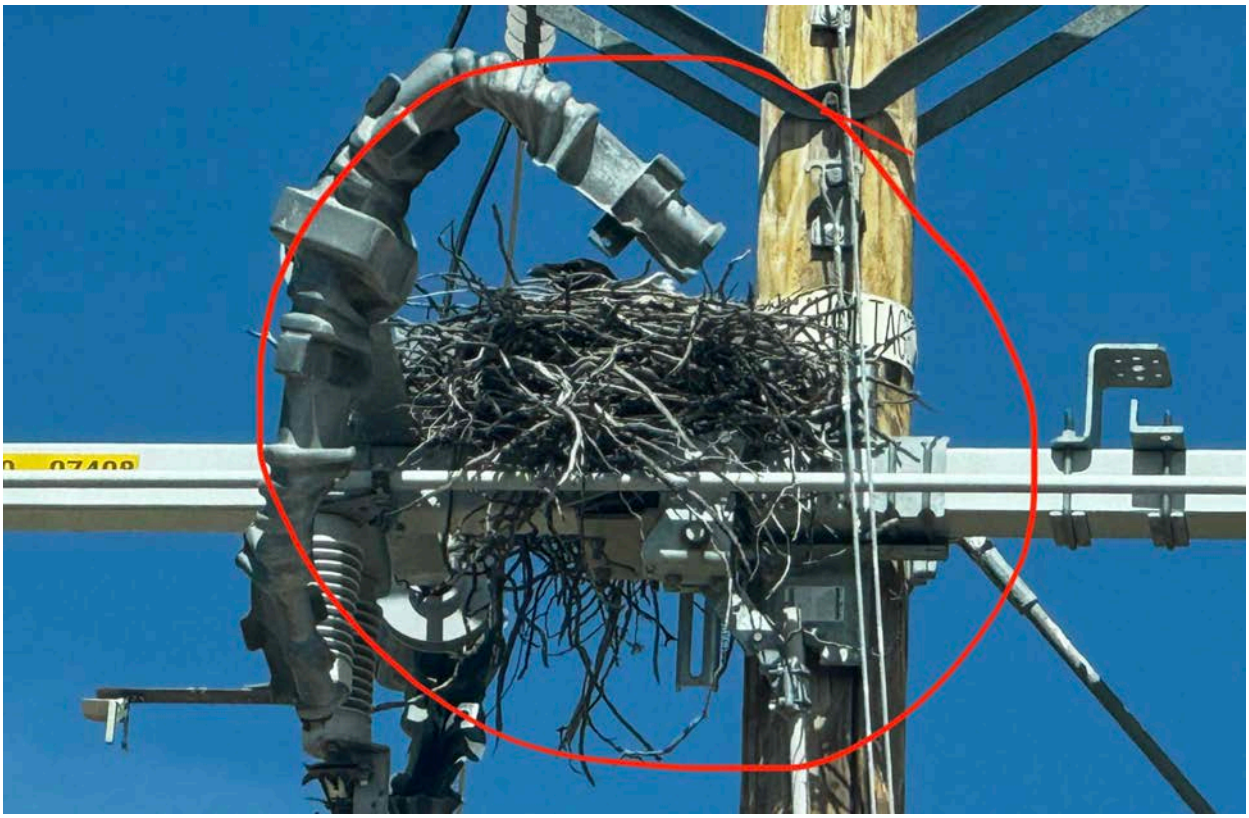
Active common raven nest in a western Joshua tree within the 5-mile survey buffer.

Photo 8



Active red-tailed hawk nest in an Aleppo pine within the 5-mile survey buffer.

Photo 9



Active common raven nest on a utility pole within the 5-mile survey buffer.

Photo 10



Active common raven nest on a lattice transmission tower within the 5-mile survey buffer.

Photo 11



Great horned owl in a western Joshua tree within the 5-mile survey buffer.

Photo 12



Swainson's hawk active nest during building (SWH01) within the 5-mile survey buffer in a Chinese elm on April 23, 2026.

Photo 13



Original Swainson's hawk nesting location (SWH01) in a Chinese elm during building.

Photo 14



Adult Swainson's hawk in flight near the active nesting territory for SWH02.

Photo 15



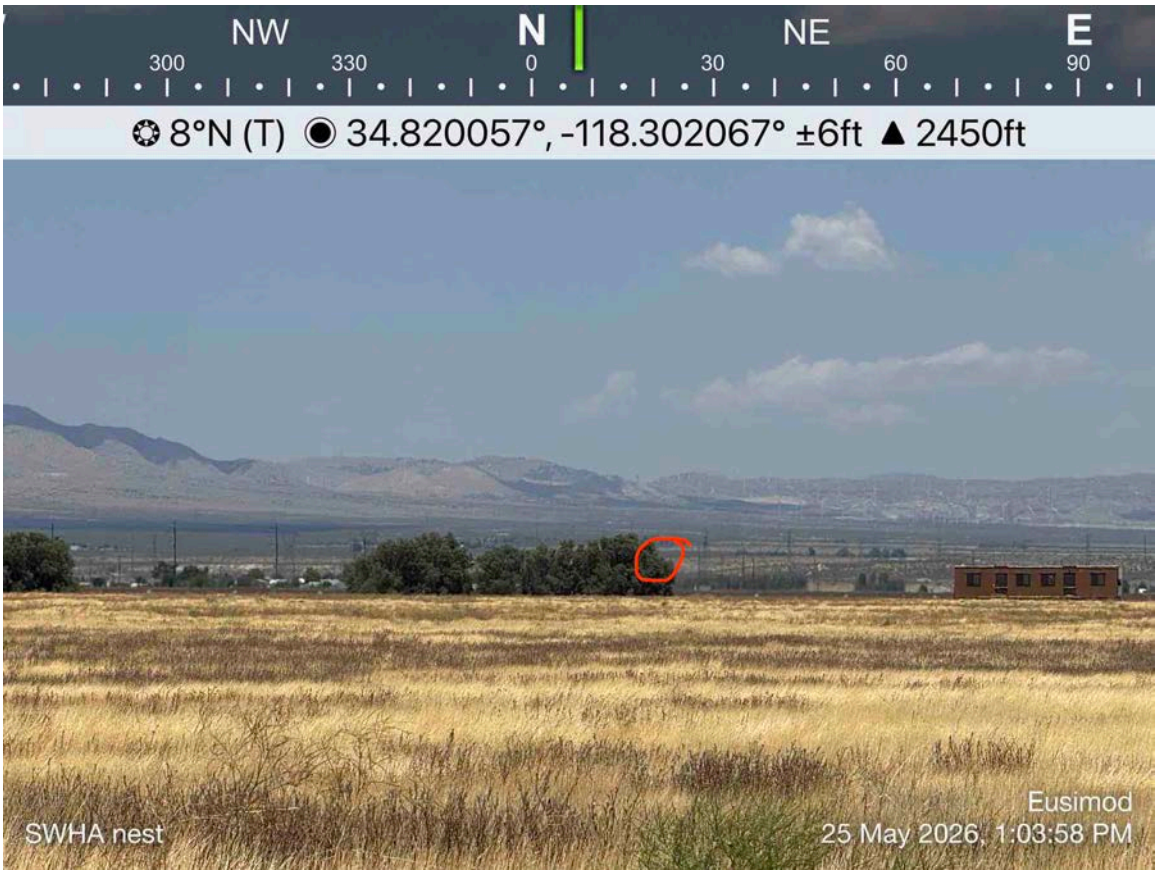
Overview of the Aleppo pine supporting the active Swainson's hawk (SWH02) nest with two nestlings.

Photo 16



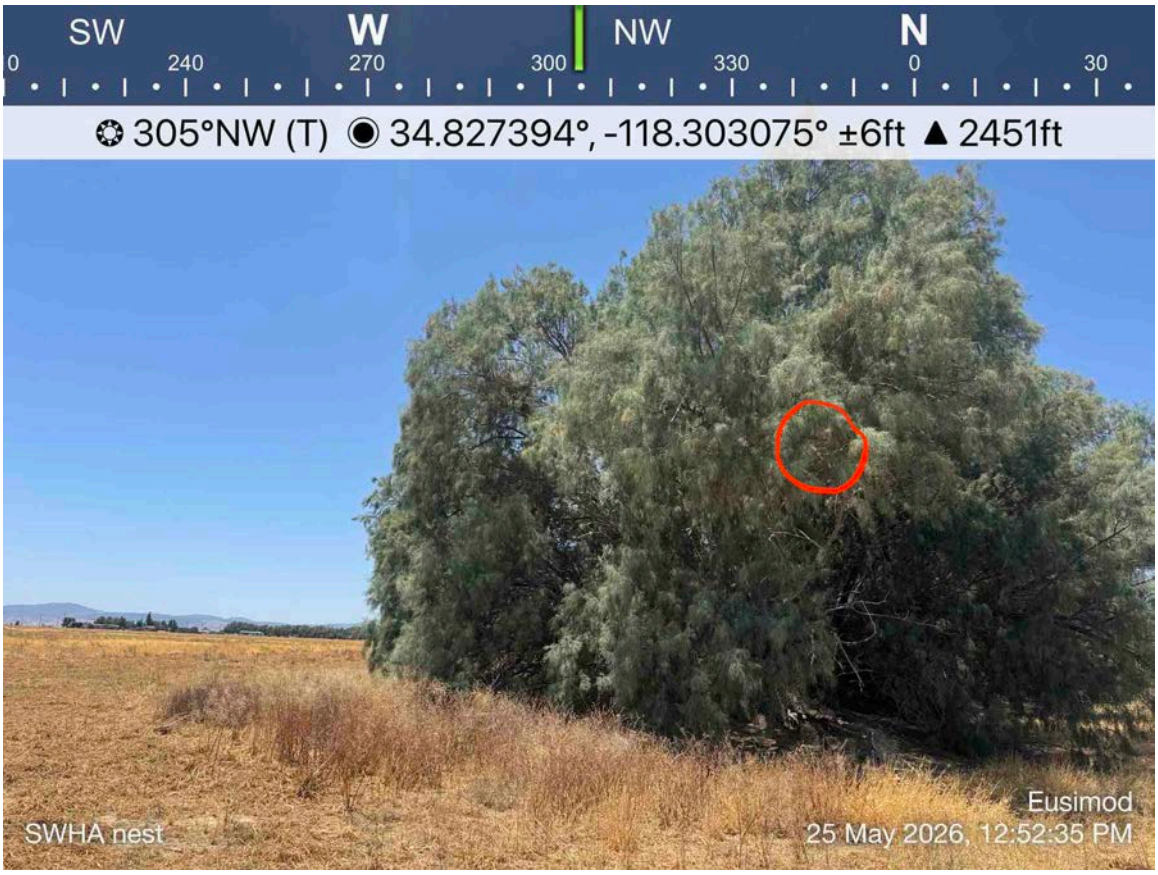
Close-up of the active Swainson's hawk nest (SWH02) in the Aleppo pine.

Photo 17



Overview of habitat and Swainson's hawk nest (SWH03) outside of the 5-mile buffer. May 25, 2026.

Photo 18



Close-up of Swainson's hawk nest (SWH03) in tamarisk hedgerow outside of the 5-mile buffer.

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Appendix C12
Protocol Crotch's Bumble Bee Survey Report

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Crotch's Bumble Bee Survey Report for the Proposed Euismod Energy Storage Project
Willow Springs, Kern County, California
2026

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EXECUTIVE SUMMARY

Species-specific surveys for Crotch's bumble bee (CBB) survey were conducted between April and June 2026 by Aardvark Biological Services, LLC at the proposed Euismod Project in Willow Springs in Kern County, California.

The purpose of the survey was to:

- Determine presence/absence of CBB.
- Conduct a habitat assessment to evaluate the likelihood of CBB occurring within or near the Project.
- Identify and document habitat features that are present on site that could support CBB, including foraging and nesting resources.

The survey concluded with the following results:

- CBB were observed foraging on site; at least four males were documented over 3 days.
- Nesting and foraging habitat are present on site. Nesting habitat includes small mammal burrows and locations of thicker vegetation such as in grasses at the base shrubs.
- Most of the site represents moderate quality habitat for CBB due to the overall low diversity of floral resources and lack of species with overlapping bloom periods. The location where the CBB was observed on the far eastern side of the site represents high quality habitat due to abundant blooming buckwheat, which may serve as an island of resources late in the season for male and new queen CBB.

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1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Euismod Project (Project) is a proposed battery energy storage project (BESS) that will utilize lithium-ion battery energy storage technology to store energy received from the grid when excess energy is available such as from intermittent renewable sources and then return it to the grid when needed. The batteries would be contained in outdoor enclosures. The BESS would be connected to an onsite substation that would interconnect with the regional electric grid at the Whirlwind 220kV substation located approximately 100 meters to the south.

The Project will require permits from Kern County and other agencies that will require environmental review pursuant to the California Environmental Quality Act (CEQA). The survey documented in this report was conducted to provide information to support the CEQA review. The purpose of the survey is to determine if CBB, a California Endangered Species Act (CESA) Candidate species occurs in the Project Area and to evaluate the existing habitat for its potential in supporting CBB even if they were not observed during the time of the survey. This report describes the methods and results of a protocol-level CBB survey of the Project Area that was conducted in Spring and Summer 2026.

1.2 PROJECT AREA DESCRIPTION

The Project Area is located in the west Mojave Desert in the Willow Springs area, west of Rosamond in Kern County, California (Figure 1). It is at the west end of Antelope Valley adjacent to the south slope of the Tehachapi Mountains, at an elevation between 2760 to 2830 feet. The Project Area is relatively flat, the eastern portion with a slight slope rising to the north and the western portion, slightly higher, with the slope rising to the northwest. It lies north of the Southern California Edison (SCE) Whirlwind Substation, is bordered to the east by 170th Street West, to the south, Rosamond Boulevard dead ends approximately at the southeast corner of the Project Area where it continues as a dirt road, and half of the Project Area is bordered to the north by an unnamed dirt road (Figures 1 & 2). There are solar installations to the south and east of the Project Area and a wind farm to the northeast. The Project is located in the Fairmont Butte USGS 1:24000 topographic map (7.5-minute quadrangle). The cadastral description of the Project is as follows:

• Township 9N, Range 15W – a portion of the south half of Section 14.

Selected representative photographs for the Project Area are provided in Appendix A.



Figure 1. Proposed Euismod Project Vicinity Map, Willow Springs, Kern County, CA

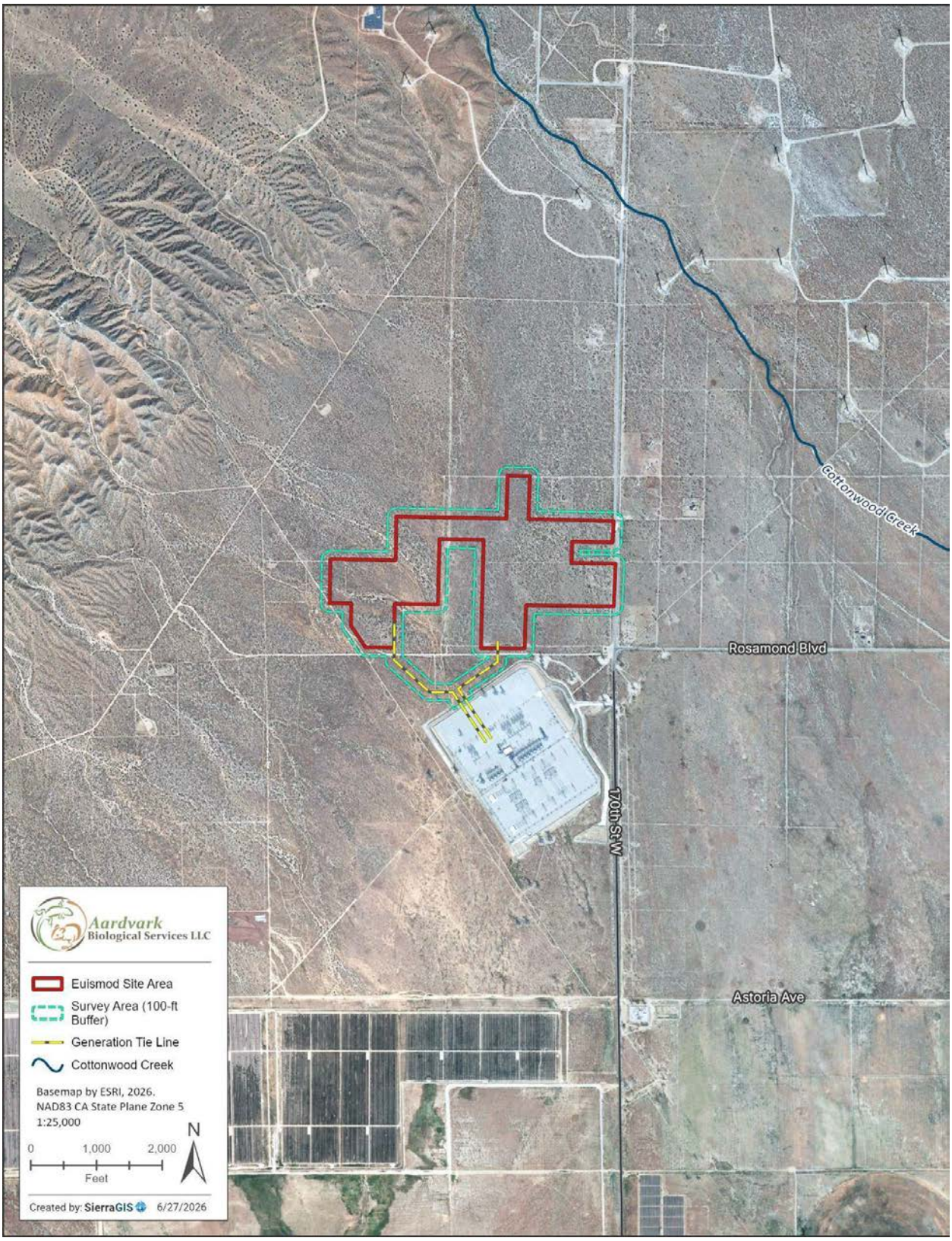


Figure 2. Proposed Euismod Project, Project Area Location Map

1.3 SUMMARY OF DATABASE SEARCH

Searches were conducted for nearby CBB observations in three databases: California Natural Diversity Database (CNDDB), iNaturalist, and Bumble Bee Watch. A Rare Plant survey was completed in 2025 by Aardvark Biological LLC; the results of this survey were also used to aid in the habitat assessment and evaluation of potential for CBB to occur within the Project Area.

In CNDDB, the two nearest and most recent CBB observations were from 2024 and occurred approximately 4-5 miles north of the site (CDFW 2026). One observation described the presence of an active CBB nest in a small mammal burrow, with multiple individuals observed foraging on abundant wildflowers. The other described a single individual found disabled with damaged wings on a compacted gravel construction site. In iNaturalist, two observations have been made within 5 miles of the site. One is approximately 3 miles southeast of the site, the other is approximately 4.5 miles to the North (Clark 2026, Adorticos 2026). Both observations are recent, from April and May of this year, and include photographs of the individuals. There are no observations within 5 miles of the site documented in Bumble Bee Watch. In this database, the nearest observation is approximately 13 miles north, and was made in 2017. The most recent observations are from 2020 and 2023 (Svejda 2020 & 2023), and are over 20 miles away, just south of California City.

2. Methods

Crotch's bumble bee surveys followed the Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species (CDFW 2023). Three field survey sessions were conducted between April and June 2026, by CBB biologist Donna Noce of Aardvark Biological Services. During each session, the biologist searched for bees while walking meandering transects within the Project. To optimize the chance of detection, survey efforts were focused on areas with the most abundant floral resources.

Surveys were completed on sunny days with no inclement weather and wind speeds generally below 8 miles per hour (mph). Survey temperatures were generally between 65°F and 90°F (Table 1). If a foraging or resting bumble bee was observed, it was photographed with an iPhone 17 Pro Max. If a worker CBB was observed, it would be followed to the extent possible in an attempt to determine if there is a nest within the site. If CBB are present, surveys and observation of individuals may continue regardless of suboptimal weather conditions. Blooming plants were identified and noted, and their percent cover estimated. Other features that may support CBB were also noted.

Table 1. Weather Condition Data for CBB Surveys

Date	Start Time	End Time	Start Temp	End Temp	Wind (mph)	Conditions
4/27/26	4:00pm	6:30pm	65.1°F	67.0°F	8	Partly cloudy
4/28/26	12:00pm	5:00pm	65.2°F	73.4°F	7	Sunny, clear
4/29/26	10:00am	4:30pm	66.7°F	77.8°F	5	Sunny, clear
4/30/26	10:00am	3:45pm	66.1°F	78.5°F	7	Sunny, clear
5/1/26	8:30am	2:40pm	70.0°F	87.0°F	7	Sunny, clear
5/19/26	9:00am	4:30pm	68.0°F	86.9°F	7	Sunny, clear
5/20/26	9:00am	4:45pm	69.2°F	85.2°F	3	Sunny, clear
5/21/26	8:00am	3:00pm	70.0°F	89.1°F	7	Sunny, smoke
6/8/26	8:00am	4:00pm	70.2°F	82.9°F	10	Sunny, clear
6/9/26	8:00am	2:00pm	71.0°F	91.0°F	5	Sunny, clear
6/10/26	8:00am	12:30pm	71.9°F	96.0°F	6	Sunny, clear

3. Results

3.1 Presence/Absence

CBB is present within the Project Area. Numerous male CBB observations were made during the last survey session, on June 8, 9 and 10. At least four distinct individuals were observed on June 8, and at least three distinct individuals were observed on June 9 and 10. On June 10, two individuals were observed at one time. Individual CBB can sometimes be distinguished by variations in black, yellow and orange patterns on the abdomen, however it can be difficult to distinguish individuals if they share a common pattern. All CBB observed were foraging on California buckwheat on the far eastern edge of the Project Area, adjacent to 170th Street West.

Photographs of distinct male CBB individuals are included in Appendix A. One yellow-faced bumble bee gyn (new queen) was also observed. Other pollinator species observed are listed below in Table 2.

Table 2. Pollinator Species Observed During CBB Surveys.

Scientific Name	Common Name
Pepsis sp.	Tarantula hawk
Apis mellifera	Western honey bee
Heliopetes ericetorum	Northern white skipper
Eupompha elegans	Elegant blister beetle
Lytta magister	Master blister beetle
Rhaphiomidas acton	Acton's flower loving fly
Triscolia ardens	Scoliid wasp
Chlorion aerarium	Steel-blue cricket hunter wasp

3.2 Habitat Assessment

The following section provides an assessment of CBB nesting, foraging, and overwintering habitat. site photos are included in Appendix A. A single vegetation community occurs through the Project Area, a creosote bush (*Larrea tridentata*) scrub alliance with sporadic western Joshua trees.

Nesting

The site supports suitable nesting habitat for CBB (Table 3). During springtime, queens emerge from their overwintering grounds and scout for nest locations. Habitat observed in the Project Area that could be used by CBB for nesting include rodent/small mammal burrows, bare ground with loose soil, and areas of dense vegetation under shrubs. These features are present throughout the site.

Table 3. Vegetation/Land Cover Types Mapped Within the Project and the Type of Habitat They May Provide for CBB

Vegetation/Land Cover Type	Total Acres in Project	Habitat Type for CBB
Creosote Bush Scrub (Onsite)	120.35 ac	Nesting, overwintering, foraging

Creosote Bush Scrub (Tie-Lines)	6.15 ac	Nesting, overwintering, foraging

Foraging

The site supports suitable foraging habitat for CBB (Table 3). After a queen chooses her nest location, she begins to produce female worker bees who forage for nectar and pollen, returning to the nest with resources to care for their mother and siblings. It is unknown exactly how far CBB workers may venture from the nest to forage, however in other bumble bee species, it's been documented to be as far as 10 kilometers (km) (Williams et al. 2014). Blooming plants were present within the Project Area during each survey session (Table 4). During the first survey session these blooming plants primarily consisted of creosote bush (*Larrea tridentata*), non-native mustards (*Sisymbrium altissimum, Brassica sp.*), and goldenhead (*Acamptopappus sphaerocephalus*). During the second and third sessions, blooming resources consisted of sparse blooms of creosote bush scattered around the site, and a patch of California buckwheat (*Eriogonum fasciculatum*) along the eastern edge, adjacent to 170th Street West. Other blooming plants, primarily small annuals, were present but were observed in much smaller numbers (Table 5). A table of all blooming plants observed on site during prior focused botanical surveys is provided in Appendix B.

Having a variety of annual and perennial flowers with separate and overlapping bloom periods helps sustain CBB and other bumble bees by providing nectar and pollen throughout the entire colony-active season. Floral resources are necessary not just to support this season's colonies, but also to support males and new queens as they mate and disperse for next season.

Table 4. Approximate Percent Cover of Blooming Plants in the Project Area Per Survey Session

Flowering Plant Species	Session 1	Session 2	Session 3
Creosote bush	10%	5%	2%
Goldenhead	2%	2%	0%
California buckwheat	0%	1%	1%
Mustard	2%	0%	0%
Other annual wildflowers (See table 5)	1%	0.5%	0%

Table 5. List of All Flowering Plant Species Observed within the Project Area During CBB Surveys

Scientific Name	Common Name
Acamptopappus sphaerocephalus	Rayless goldenhead
Amsinckia sp.	Fiddleneck
Brassica sp.	Mustard
Camissonia sp.	Sun cup
Ericameria nauseosa	Rubber rabbitbrush
Eriogonum fasciculatum	California buckwheat
Eriogonum gracillimum	Rose-and-white wild buckwheat
Erodium cicutarium	redstem filaree
Larrea tridentata	Creosote bush
Lessingia sp.	Lessingia
Loeseliastrum matthewsii	Desert calico
Loeseliastrum schottii	Schott's gilia
Sisymbrium altissimum	Tall tumble mustard
Stephanomeria pauciflora	Wire-lettuce

Overwintering

The site supports suitable overwintering habitat (Table 3). New queens produced at the end of the colony's active period will mate, spend time foraging, and then find a location to overwinter underground until spring arrives. Little is currently known about the habitat requirements for overwintering queens, or how far a new queen may travel from where she was produced in search of an overwintering location. Therefore, the assessment of suitable overwintering habitat within the Project Area incorporates a conservative approach.

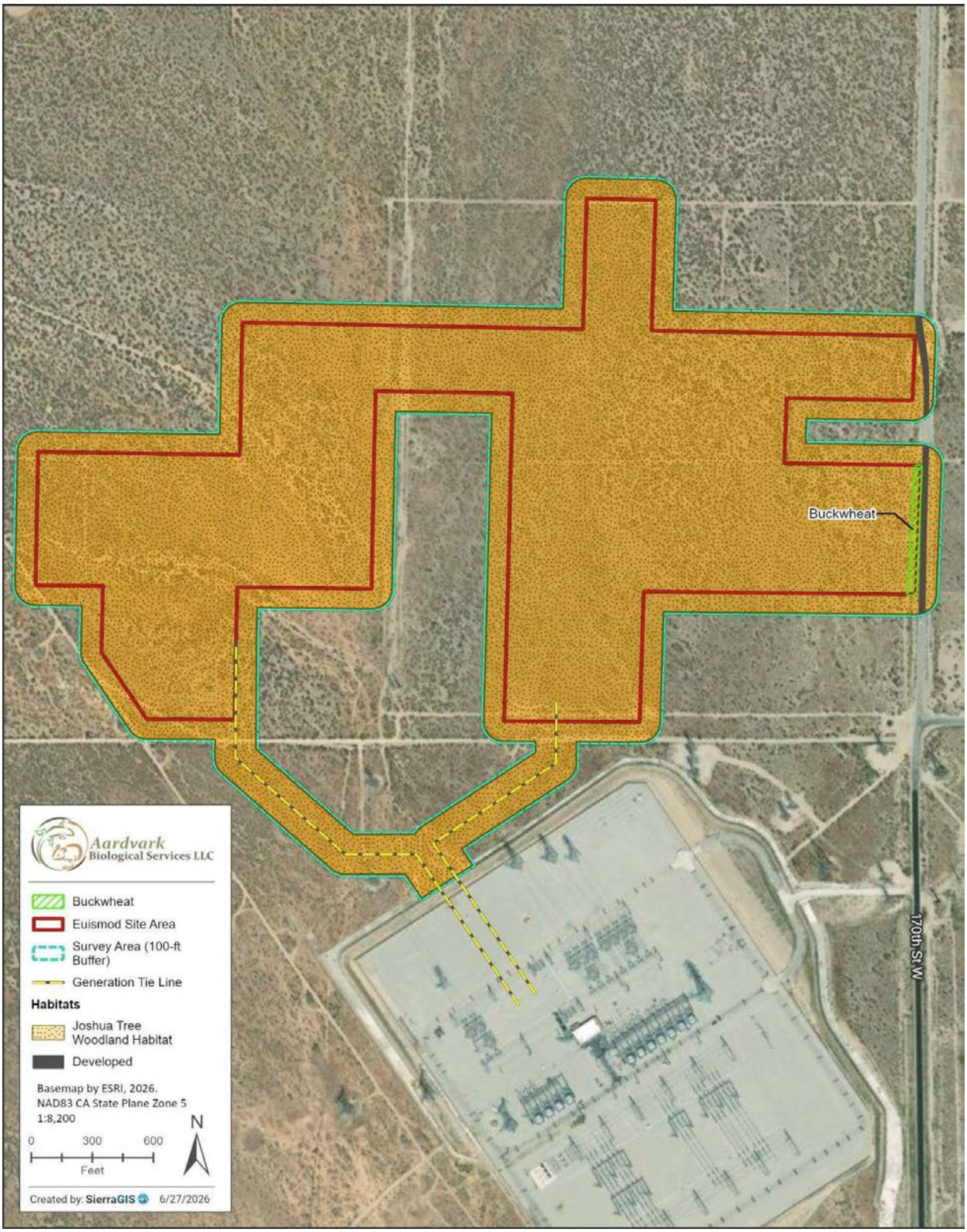


Figure 3. Proposed Euismod Project Area Habitat and CBB Observation Location Map, Willow Springs, Kern County, CA

4. Discussion

The Project is within the historic and current known range of Crotch's bumble bee, and recent observations have been documented throughout the Antelope Valley, particularly at the bases of the nearby foothills (Figure 4).

Typically, flowering plants with overlapping bloom periods would supply CBB and other bumble bee species in the area with nectar and pollen from the queen flight season, all the way through the colony-active period. According to the CDFW Guidelines, the queen flight season for CBB is from February through March, and the colony-active period spans from April through August. Based on positive results from other CBB surveys performed in similar arid habitat in the Mojave Desert and Western Kern County and the timing of the males and gyns production by queens, it's possible that CBB in the region may have a shortened colony active period. This could be a local adaptation to the region's arid climate and short wildflower bloom period. The large patch of California buckwheat was located along the edge of 170th Street West, just south of Cottonwood Creek, and continued south for many miles beyond the Project Area. Growth of these shrubs is likely induced by increased moisture and seed disposition from flows of water from upstream and along the road edge. It is possible that the presence of this buckwheat blooming late in this region's colony active season may serve as an oasis for the species, thus attracting and supporting males and new queens.

The greatest risk of impact to CBB would be vegetation clearance and ground disturbance, which could disrupt nesting or overwintering bees. CBB nests can be difficult to detect in large project areas and amidst thicker vegetation, however, can be avoided with a no-work buffer in coordination with CDFW if found. Overwintering bees are more difficult to detect and avoid, as they are inactive underground. Very little is currently known about overwintering habitat requirements or features. The guidelines do not recommend surveying for overwintering bees for this reason. Removal of vegetation while in bloom could also impact foraging CBB.

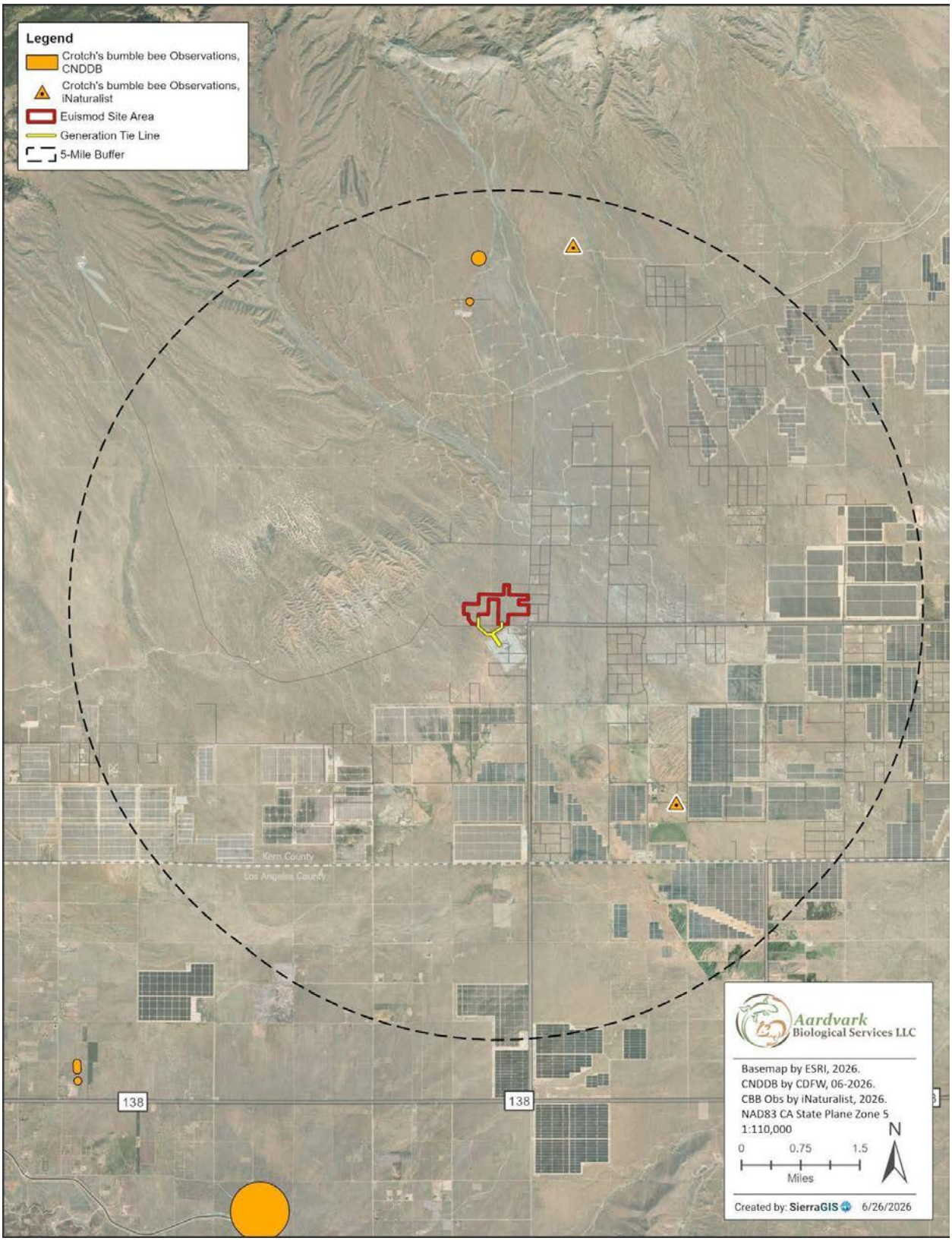


Figure 4. Proposed Euismod Project CNDDB and iNaturalist Search Results Map

5. Literature Cited

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APPENDIX A. Photo Appendix



Photo 1. Representative photo of Project Area during the first survey session, taken on May 1, 2026. Photo shows Joshua tree woodland with blooming creosote bush and goldenhead adjacent to a dry wash that is present on site. Additional blooming plants are present but not captured well in photo. Photo by DN.



Photo 2. Representative photo of the Project Area during the second survey session, taken on May 20, 2026. Photo shows Joshua tree woodland habitat with blooming Creosote bush and goldenhead amidst expired annuals and non-native grasses. Photo by DN.



Photo 3. Representative photo of the Project Area taken May 21, 2026, during the second survey session. Photo was taken facing east into the Project Area and shows Joshua tree woodland with creosote shrubs amidst expired annuals and non-native. Photo by DN.



Photo 4. Representative photo of blooming California buckwheat taken June 9, 2026, during the survey session. 170th Street West is visible on the left. This area is where all CBB observations were made.



Photo 5. Male CBB observed foraging on California buckwheat on June 8, 2026. Photo by DN.

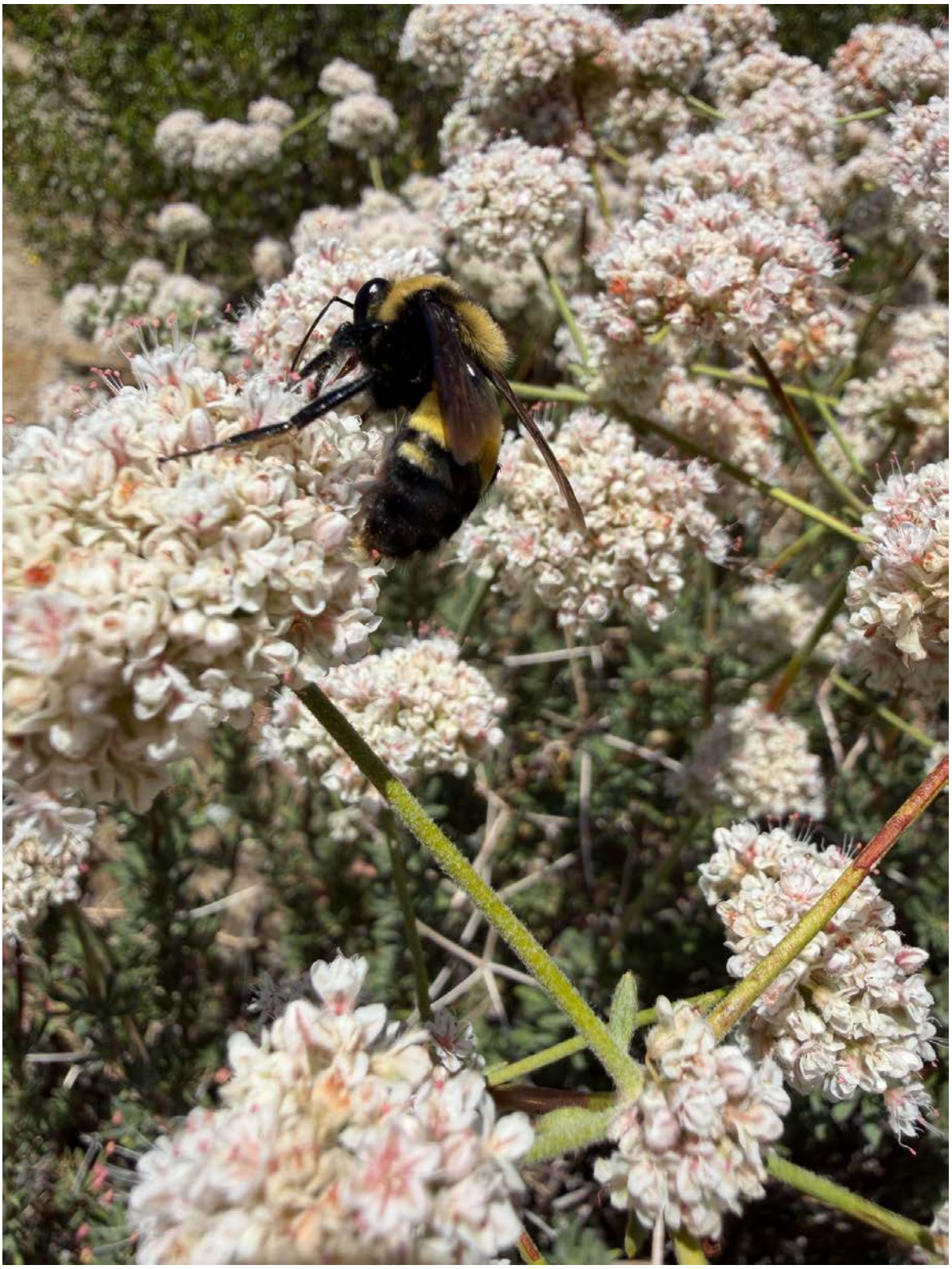


Photo 6. Male CBB observed on June 9, 2026, foraging on California buckwheat. Photo by DN.



Photo 7. Male CBB observed June 10, 2026, foraging on California buckwheat. Photo by DN.



Photo 8. Male CBB observed June 10, 2026 foraging on California buckwheat. Photo by DN.

Appendix B. Table of all flowering plants observed within the Project Area

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
GYMNOSPERMS		
EPHEDRACEAE	**EPHEDRA FAMILY**	
Ephedra nevadensis	Nevada ephedra	shrub
EUDICOT FLOWERING PLANTS		
ASTERACEAE	**SUNFLOWER FAMILY**	
Acamptopappus sphaerocephalus var. *hirtellus*	goldenhead	shrub
Ambrosia acanthicarpa	annual bur-sage	annual herb
Ambrosia dumosa	burro bush	shrub
Ambrosia salsola	cheesebush	shrub
Encelia actoni	Acton encelia	shrub
Ericameria cooperi var. *cooperi*	Cooper's goldenbush	shrub
Ericameria nauseosa	rubber rabbitbrush	shrub
Gutierrezia microcephala	sticky snakeweed	shrub
Lasthenia gracilis	common goldfields	annual herb
Lessingia glandulifera var. glandulifera	vinegar-weed	annual herb
Lessingia sp.	vinegar-weed	annual herb
Logfia depressa	dwarf cottonrose	annual herb
Malacothrix glabrata	desert dandelion	annual herb
Stephanomeria exigua ssp. *exigua*	small wirelettuce	annual herb
Stephanomeria pauciflora	wire-lettuce	perennial herb/subshrub
BORAGINACEAE	**BORAGE FAMILY**	
Amsinckia intermedia	common fiddleneck	annual herb
Amsinckia tessellata var. *tessellata*	desert fiddleneck	annual herb
Cryptantha micrantha var. *micrantha*	red-root cryptantha	annual herb
Cryptantha muricata var. *muricata*	showy prickly cryptantha	annual herb
Greeneocharis circumscissa var. *circumscissa*	cushion greeneocharis	annual herb
Pectocarya heterocarpa	mixed-nut pectocarya	annual herb
Pectocarya linearis ssp. *ferocula*	narrow-toothed pectocarya	annual herb
Plagiobothrys arizonicus	Arizona popcornflower	annual herb
BRASSICACEAE	**MUSTARD FAMILY**	
Brassica sp.[3]	mustard	annual herb
Sisymbrium altissimum[3]	tumble mustard	annual herb
CACTACEAE	**CACTUS FAMILY**	
Cylindropuntia echinocarpa[2]	silver cholla	perennial stem succulent
CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
Grayia spinosa	spiny hope-sage	shrub
Krascheninnikovia lanata	winter fat	shrub
Salsola tragus[3]	Russian-thistle	annual herb
EUPHORBIACEAE	**SPURGE FAMILY**	
Croton setigerus	turkey-mullein	annual herb
Euphorbia albomarginata	Rattlesnake weed	perennial herb
FABACEAE	**LEGUME FAMILY**	
Astragalus didymocarpus	two-seeded milkvetch	annual herb
Astragalus layneae	Layne milkvetch	perennial herb

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
Astragalus lentiginosus var. *variabilis*	freckled milkvetch	annual, perennial herb
GERANIACEAE	**GERANIUM FAMILY**	
Erodium cicutarium[3]	red-stemmed filaree	annual herb
LAMIACEAE	**MINT FAMILY**	
Salvia carduacea	thistle sage	annual herb
Salvia columbariae	chia sage	annual herb
MALVACEAE	**MALLOW FAMILY**	
Eremalche exilis	white mallow	annual herb
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**	
Mirabilis laevis[5]	wishbone bush	subshrub
ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
Camissonia campestris ssp. *campestris*	Mojave sun cup	annual herb
Camissonia kernensis ssp. *gilmanii*	Gilman's evening-primrose	annual herb
Camissoniopsis pallida ssp. *pallida*	pale sun cup	annual herb
POLEMONIACEAE	**PHLOX FAMILY**	
Loeseliastrum matthewsii	desert calico	annual herb
Loeseliastrum schottii	Schott gilia	annual herb
POLYGONACEAE	**BUCKWHEAT FAMILY**	
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb
Chorizanthe watsonii	Watson's spineflower	annual herb
Eriogonum brachyanthum	short-flower wild buckwheat	annual herb
Eriogonum fasciculatum var. *fasciculatum*[4]	California buckwheat	shrub
Eriogonum fasciculatum var. *polifolium*	Mojave Desert California buckwheat	shrub
Eriogonum gracillimum	rose-and-white wild buckwheat	annual herb
Eriogonum plumatella	yucca wild buckwheat	shrub
Eriogonum viridescens	two-toothed wild buckwheat	annual herb
SOLANACEAE	**NIGHTSHADE FAMILY**	
Lycium andersonii	desert tomato	shrub
Lycium cooperi	box-thorn	shrub
ZYGOPHYLLACEAE	**CALTROP FAMILY**	
Larrea tridentata	creosote bush	shrub
MONOCOT FLOWERING PLANTS		
ASPARAGACEAE	**ASPARAGUS FAMILY**	
Yucca brevifolia[1,2]	western Joshua tree	perennial leaf succulent
POACEAE	**GRASS FAMILY**	
Bromus diandrus[3]	ripgut grass	annual grass
Bromus rubens[3]	red brome, foxtail chess	annual grass
Bromus tectorum[3]	cheatgrass	annual grass
Hordeum murinum[3]	wall barley	annual grass
Schismus spp. [3]	Mediterranean grass	annual grass
Stipa hymenoides	sand rice grass	perennial grass
Stipa speciosa	desert needlegrass	perennial grass

[1] special status species
[2] State Candidate for Listing as Threatened and CDNPA species
[3] non-native weed
[4] planted, roadside
[5] variety could not be determined

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